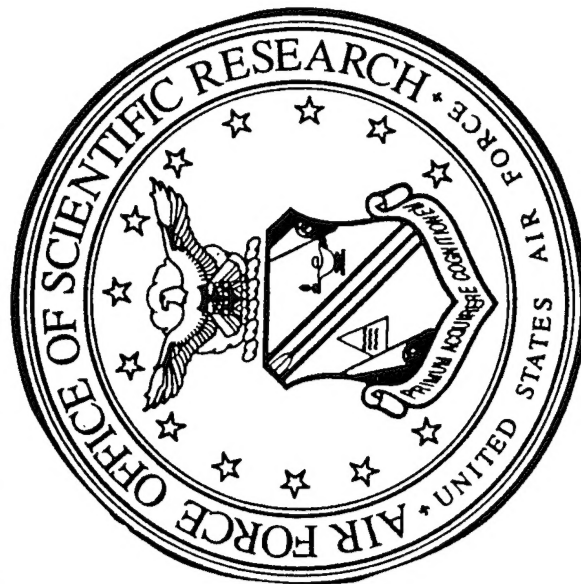


# AIR FORCE OFFICE OF SCIENTIFIC RESEARCH

AFOSR

## TECHNICAL REPORT SUMMARIES



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## INTRODUCTION

The Air Force Office of Scientific Research (AFOSR) Technical Report Summaries is published quarterly (March, June, September, and December). It contains a brief summary of each technical report received in the Technical Information Division and submitted to the Defense Technical Information Center (DTIC) for the quarter. Three indexes, subject, personal author and title are provided to help the user locate reports that may be of interest.

AFOSR does not maintain copies of technical reports for distribution. However, you may obtain any of these reports if you are registered with DTIC by requesting the AD number of that report from the DTIC, Cameron Station, Alexandria, Virginia, 22314.

## PURPOSE

The purpose of this report is to inform Air Force Laboratories about the science that the Air Force Office of Scientific Research is supporting.

## AFOSR MISSION

The Air Force Office of Scientific Research (AFOSR) is the single manager of the Air Force Defense Research Sciences Program (Program Element 61102F) and the primary Air Force agency for the extramural support of fundamental scientific research. To sponsor and sustain basic research and ensure access to research results in support of the Air Force goals of control and maximum utilization of air and space. The AFOSR is organized under the Director, Science and Technology, Air Force Materiel Command.

AFOSR awards grants and contracts for research in areas of science relevant to the needs of the Air Force. Research is selected for support from proposals received in response to the Broad Agency Announcement originating from scientists investigating problems involving the search for new knowledge and the expansion of scientific principles. Selection is on the basis of scientific potential for improving Air Force

operational capabilities, originality, significance of science, the qualification of the principal investigators, and the reasonableness of the proposed budget.

## KEY TO READING THE DATA

The summaries consist of three indexes and the abstracts. From one of the indexes, located in the AD number of the report that is of interest to you. Use this number to locate the abstract of the report in the abstracts sections. The first report submitted to DTIC during the quarter (the one with the lowest AD number) appears on the last page of the abstracts section. The last report submitted to DTIC during the quarter (the one with the highest DTIC number) appears on the first page of the abstracts section. The following terms will give you a brief description of the elements used in each summary of this report.

DTIC Report Bibliography - DTIC's brief description of a technical report.

Search Control Number - A number assigned by DTIC at the time a bibliography is printed.

AD Number - A number assigned to each technical report when received by the DTIC.

Field & Group Numbers - (appearing after the AD number) First number is the subject field, and the second number is the particular group under that subject field.

Corporate Author/Performing Organization - The organization; e.g., college/university, company, etc., at which the research is conducted.

Title - The title of the technical report.

Descriptive Note - Gives the type of report; e.g., final, interim, etc., and the time period of the research.

Date - Date of the technical report.

Pages - Total number of pages contained in the technical report.

Personal Author - Person or persons who wrote the report.

Contract/Grant Number - The instrument control number identifying the contracting activity and funding year under which the research is initiated.

Project Number - A number unique to a particular area of science; e.g., 2304 is the project number for mathematics.

Task Number - An alphanumeric number unique to a specific field of the main area of science; e.g., 2304 is the project number for mathematics and A3 is the task number for computational sciences.

Monitor Number - The number assigned to a particular report by the government agency monitoring the research. The number consists of the government monitor acronym, the present calendar year and the technical report assigned consecutively; e.g., AFOSR-TR-93-0001 is the first number used for the first technical report processed for calendar year 1993.

Supplementary Note - A variety of statements pertaining to a report. For example, if the report is a journal article, the supplementary note might give you the journal citation, which will include the name of the journal that article it appears in, and the volume number, date and the page numbers of the journal.

Abstract - A brief summary describing the research of the report.

Descriptors - Key words describing the research.

Identifiers - Commonly used designators, such as names of equipment, names of projects or acronyms, the AFOSR project and task number, and the Air Force Research Program Element number.

## **CONTRACT INDEX**

## UNCLASSIFIED

## CONTRACT INDEX

\*AFOSR-89-0392  
CALIFORNIA UNIV DAVIS DEPT OF  
MECHANICAL ENGINEERING  
(AFOSR-TR-94-0378)  
AD-A280 932  
CALIFORNIA UNIV DAVIS  
(AFOSR-TR-94-0379)  
AD-A280 930  
(AFOSR-TR-94-0377)  
AD-A280 973

\*AFOSR-89-0479  
TEXAS UNIV AT AUSTIN  
(AFOSR-TR-94-0424)  
F AD-A282 944

\*AFOSR-90-0152B  
ILLINOIS INST OF TECH CHICAGO  
DEPT OF METALLURGICAL AND  
MATERIALS ENGINEERING  
5-54718-1  
(AFOSR-TR-94-0545)  
F AD-A283 959

\*AFOSR-90-0160  
ALABAMA A AND M UNIV NORMAL  
(AFOSR-TR-94-0443)  
AD-A282 785

\*AFOSR-90-0191  
CLEMSON UNIV SC  
(AFOSR-TR-94-0423)  
F AD-A282 448

\*AFOSR-90-0307  
MISSOURI UNIV-COLUMBIA DEPT OF  
PHYSICS AND ASTRONOMY  
(AFOSR-TR-94-0476)  
F AD-A284 131

\*AFOSR-90-0366  
CALIFORNIA UNIV IRVINE DEPT OF  
MECHANICAL AND AEROSPACE  
ENGINEERING  
(AFOSR-TR-94-0482)  
F AD-A284 169

\*AFOSR-91-0001  
GEORGIA UNIV ATHENS DEPT OF  
CHEMISTRY  
(AFOSR-TR-94-0439)

AD-A283 194  
GEORGIA UNIV RESEARCH FOUNDATION  
INC ATHENS  
(AFOSR-TR-94-0483)  
F AD-A284 108

\*AFOSR-91-0009  
AIR TRAINING COMMAND RANDOLPH AFB  
TX DCS/TECHNICAL TRAINING  
(AFOSR-TR-94-0465)  
F AD-A282 548

\*AFOSR-91-0056  
EMORY UNIV ATLANTA GA  
(AFOSR-TR-94-0434)  
F AD-A282 597

\*AFOSR-91-0061  
STANFORD UNIV CA DEPT OF  
MATHEMATICS  
(AFOSR-TR-94-0328)  
F AD-A282 217

\*AFOSR-91-0079  
MASSACHUSETTS INST OF TECH  
CAMBRIDGE DEPT OF CHEMISTRY  
3  
(AFOSR-TR-94-0479)  
F AD-A284 194

\*AFOSR-91-0083  
VIRGINIA POLYTECHNIC INST AND  
STATE UNIV BLACKSBURG  
(AFOSR-TR-94-0391)  
F AD-A281 312

\*AFOSR-91-0124  
MARYLAND UNIV COLLEGE PARK OFFICE  
OF RESEARCH ADMINISTRATION AND  
ADVANCEMENT  
(AFOSR-TR-94-0401)  
F AD-A281 284

\*AFOSR-91-0125  
CALIFORNIA UNIV SANTA BARBARA  
COLL OF ENGINEERING  
(AFOSR-TR-94-0522)  
F AD-A283 960

\*AFOSR-91-0132  
MARYLAND UNIV COLLEGE PARK DEPT

OF ELECTRICAL ENGINEERING  
(AFOSR-TR-94-0457)  
F AD-A282 649

\*AFOSR-91-0137  
CORNELL UNIV ITHACA NY LAB OF  
ATOMIC AND SOLID STATE PHYSICS  
(AFOSR-TR-94-0390)  
A AD-A281 369

\*AFOSR-91-0154  
JOHNS HOPKINS UNIV BALTIMORE MD  
SCHOOL OF MEDICINE  
(AFOSR-TR-94-0450)  
F AD-A282 547

\*AFOSR-91-0163  
WAKE FOREST UNIV WINSTON-SALEM  
NC DEPT OF MATHEMATICS  
(AFOSR-TR-94-0392)  
F AD-A281 213

\*AFOSR-91-0169  
HARVARD UNIV CAMBRIDGE MA DEPT OF  
PSYCHOLOGY  
(AFOSR-TR-94-0485)  
F AD-A284 203

\*AFOSR-91-0189  
IDAHO UNIV MOSCOW  
(AFOSR-TR-94-0455)  
F AD-A282 767

\*AFOSR-91-0199  
ARIZONA UNIV TUCSON  
(AFOSR-TR-94-0382)  
F AD-A280 982

\*AFOSR-91-0212  
ENGINEERING FOUNDATION NEW YORK  
(AFOSR-TR-94-0539)  
F AD-A284 028

\*AFOSR-91-0213  
OHIO STATE UNIV RESEARCH  
FOUNDATION COLUMBUS  
OSURF-768992/724639  
(AFOSR-TR-94-0389)  
F AD-A280 892

\*AFOSR-91-0291

CONTRACT INDEX-1

UNCLASSIFIED T4035K

## UNCLASSIFIED

HUXLEY COLL OF ENVIRONMENTAL  
STUDIES BELLINGHAM WA INST OF  
ENVIRONMENTAL TOXI COLOGY AND  
CHEMISTRY  
(AFOSR-TR-94-0524)  
F AD-A284 426

\*AFOSR-91-0298  
KANSAS STATE GEOLOGICAL SURVEY  
LAWRENCE  
KGS-OFR-94-32  
(AFOSR-TR-94-0474)  
A AD-A284 193

\*AFOSR-91-0299  
CALIFORNIA UNIV SANTA BARBARA  
DEPT OF ELECTRICAL AND COMPUTER  
ENGINEERING  
(AFOSR-TR-94-0419)  
F AD-A282 626

\*AFOSR-91-0317  
CALIFORNIA UNIV LOS ANGELES DEPT  
OF MATERIALS SCIENCE AND  
ENGINEERING  
(AFOSR-TR-94-0431)  
A AD-A282 946

\*AFOSR-91-0336  
PENNSYLVANIA STATE UNIV  
UNIVERSITY PARK  
(AFOSR-TR-94-0578)  
F AD-A284 780

\*AFOSR-91-0340  
COLUMBIA UNIV NEW YORK DEPT OF  
CHEMISTRY  
(AFOSR-TR-94-0440)  
AD-A283 184  
(AFOSR-TR-94-0441)  
AD-A283 195  
COLUMBIA UNIV NEW YORK LOWELL  
MEMORIAL LIBRARY  
(AFOSR-TR-94-0442)  
AD-A282 855

\*AFOSR-91-0436  
CORNELL UNIV ITHACA NY  
(AFOSR-TR-94-0381)  
A AD-A280 931

\*AFOSR-93-1-0407  
BRIGHAM AND WOMEN'S HOSPITAL  
BOSTON MA  
(AFOSR-TR-94-0541)  
A AD-A283 956

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CALIFORNIA UNIV LOS ANGELES DEPT  
OF ASTRONOMY  
(AFOSR-TN-59-1045)  
AD-B189 080

\*AF 49(638)-659  
AVCO EVERETT RESEARCH LAB INC  
EVERETT MA  
RR-89  
(AFOSR-TN-60-935)  
AD-B188 916

\*FA9620-92-J-0072  
COLORADO UNIV AT BOULDER  
(AFOSR-TR-94-0526)  
AD-A284 200

\*FA9620-92-J-0260  
MARYLAND UNIV COLLEGE PARK OFFICE  
OF RESEARCH ADMINISTRATION AND  
ADVANCEMENT  
(AFOSR-TR-94-0468)  
A AD-A282 938

\*FA9620-89-C-0049  
SAM TECHNOLOGY INC SAN FRANCISCO  
CA  
(AFOSR-TR-94-0477)  
F AD-A284 362

\*FA9620-90-C-0070  
TRW SPACE AND ELECTRONICS GROUP  
REDONDO BEACH CA  
(AFOSR-TR-94-0380)  
AD-A280 984  
TRW SPACE AND TECHNOLOGY GROUP  
REDONDO BEACH CA  
(AFOSR-TR-94-0376)  
AD-A280 985

\*FA9620-91-C-0013  
JACKSON STATE UNIV MS DEPT OF  
MATHEMATICS  
(AFOSR-TR-94-0544)

CONTRACT INDEX-2  
UNCLASSIFIED T4035K

F AD-A284 122

\*FA9620-91-C-0016  
SCIENTIFIC RESEARCH ASSOCIATES INC  
GLASTONBURY CT  
SRA-R94-9134-F  
(AFOSR-TR-94-0402)  
F AD-A281 156  
R9133-F  
(AFOSR-TR-94-0453)  
F AD-A283 338

\*FA9620-91-C-0050  
SRI INTERNATIONAL MENLO PARK CA  
(AFOSR-TR-94-0508)  
A AD-A284 174

\*FA9620-91-C-0056  
UNITED TECHNOLOGIES RESEARCH  
CENTER EAST HARTFORD CT  
UTRC-94-28  
(AFOSR-TR-94-0519)  
F AD-A284 257

\*FA9620-91-C-0065  
CRYOPOWER ASSOCIATES LOS ALAMOS  
NM  
(AFOSR-TR-94-0467)  
F AD-A282 996

\*FA9620-91-C-0078  
NETROLOGIC INC SAN DIEGO CA  
(AFOSR-TR-94-0422)  
F AD-A282 930

\*FA9620-91-C-0083  
COGNITECH INC SANTA MONICA CA  
TR-31  
(AFOSR-TR-94-0518)  
F AD-A284 107

\*FA9620-91-1-0294  
ROCHESTER UNIV NY DEPT OF ANATOMY  
(AFOSR-TR-94-0373)  
F AD-A280 978

\*FA9620-92-C-0003  
MATERIALS TECHNOLOGIES CORP MONROE  
CT  
W/O-9121  
(AFOSR-TR-94-0466)

AFO-F49



## UNCLASSIFIED

F AD-B187 187  
 \*F49620-92-J-0010  
 MASSACHUSETTS INST OF TECH  
 CAMBRIDGE  
 (AFOSR-TR-94-0456)  
 F AD-A282 333  
 \*F49620-92-J-0011  
 OKLAHOMA STATE UNIV STILLWATER  
 DEPT OF CHEMISTRY  
 OSU-1-5-19592  
 (AFOSR-TR-94-0538)  
 AD-A284 205  
 \*F49620-92-J-0056  
 BOSTON UNIV MA COLL OF  
 ENGINEERING  
 (AFOSR-TR-94-0517)  
 F AD-A284 208  
 \*F49620-92-J-0073  
 EMORY UNIV ATLANTA GA DEPT OF  
 CHEMISTRY  
 (AFOSR-TR-94-0435)  
 AD-A282 735  
 EMORY UNIV ATLANTA GA SCHOOL OF  
 DENTISTRY  
 (AFOSR-TR-94-0437)  
 AD-A282 563  
 EMORY UNIV ATLANTA GA  
 (AFOSR-TR-94-0436)  
 AD-A282 546  
 \*F49620-92-J-0081  
 BROWN UNIV PROVIDENCE RI DIV OF  
 APPLIED MATHEMATICS  
 (AFOSR-TR-94-0393)  
 F AD-A281 219  
 \*F49620-92-J-0084  
 NEW YORK UNIV MEDICAL CENTER NY  
 (AFOSR-TR-94-0505)  
 A AD-A284 219  
 \*F49620-92-J-0104  
 TEXAS UNIV AT AUSTIN DEPT OF  
 CHEMISTRY  
 (AFOSR-TR-94-0511)  
 A AD-A284 102

\*F49620-92-J-0133  
 CARNEGIE-MELLON UNIV PITTSBURGH  
 PA  
 (AFOSR-TR-94-0428)  
 F AD-A282 449  
 \*F49620-92-J-0141  
 FLORIDA UNIV GAINESVILLE QUANTUM  
 THEORY PROJECT  
 (AFOSR-TR-94-0529)  
 AD-A284 198  
 \*F49620-92-J-0151  
 PRINCETON UNIV NJ DEPT OF  
 MECHANICAL AND AEROSPACE  
 ENGINEERING  
 (AFOSR-TR-94-0489)  
 F AD-A284 196  
 \*F49620-92-J-0161  
 PENNSYLVANIA STATE UNIV  
 UNIVERSITY PARK DEPT OF  
 MECHANICAL ENGINEERING  
 (AFOSR-TR-94-0462)  
 AD-A282 562  
 \*F49620-92-J-0168  
 UNIVERSITY OF SOUTHERN CALIFORNIA  
 DOWNEY  
 (AFOSR-TR-94-0458)  
 A AD-A282 726  
 \*F49620-92-J-0169  
 YALE UNIV NEW HAVEN CT  
 (AFOSR-TR-94-0413)  
 A AD-A281 336  
 \*F49620-92-J-0184  
 CALIFORNIA UNIV SAN DIEGO LA  
 JOLLA  
 (AFOSR-TR-94-0375)  
 A AD-A280 933  
 \*F49620-92-J-0216  
 MICHIGAN UNIV ANN ARBOR  
 UMCEE-94-19  
 (AFOSR-TR-94-0478)  
 F AD-A283 957  
 \*F49620-92-J-0218  
 WRIGHT STATE UNIV KETTERING OH

DEPT OF BIOCHEMISTRY  
 (AFOSR-TR-94-0400)  
 A AD-A281 310  
 \*F49620-92-J-0222  
 TENNESSEE UNIV KNOXVILLE DEPT OF  
 CHEMISTRY  
 (AFOSR-TR-94-0500)  
 A AD-A284 147  
 \*F49620-92-J-0227  
 PRINCETON UNIV NJ DEPT OF  
 MECHANICAL AND AEROSPACE  
 ENGINEERING  
 (AFOSR-TR-94-0501)  
 A AD-A284 126  
 \*F49620-92-J-0238  
 TEXAS A AND M UNIV COLLEGE  
 STATION DEPT OF BIOLOGY  
 (AFOSR-TR-94-0515)  
 A AD-A284 132  
 \*F49620-92-J-0243  
 WASHINGTON STATE UNIV PULLMAN  
 DEPT OF PSYCHOLOGY  
 (AFOSR-TR-94-0370)  
 A AD-A280 956  
 \*F49620-92-J-0246  
 MEHARRY MEDICAL COLL NASHVILLE TN  
 (AFOSR-TR-94-0386)  
 A AD-A280 893  
 \*F49620-92-J-0267  
 CALIFORNIA UNIV SANTA BARBARA  
 INST FOR POLYMERS AND ORGANIC  
 SOLIDS  
 (AFOSR-TR-94-0540)  
 A AD-A283 958  
 \*F49620-92-J-0278  
 CALIFORNIA INST OF TECH PASADENA  
 (AFOSR-TR-94-0409)  
 A AD-A281 304  
 \*F49620-92-J-0293  
 MICHIGAN STATE UNIV EAST LANSING  
 DEPT OF PEDIATRICS/HUMAN  
 DEVELOPMENT  
 (AFOSR-TR-94-0421)

CONTRACT INDEX-3  
 UNCLASSIFIED T4035K

F49-F49

## UNCLASSIFIED

A AD-A282 452  
 \*F49620-92-J-0296  
 PENNSYLVANIA STATE UNIV  
 UNIVERSITY PARK DEPT OF CHEMISTRY  
 (AFOSR-TR-94-0502)  
 A AD-A284 204  
 \*F49620-92-J-0310  
 WISCONSIN UNIV-MADISON DEPT OF  
 PSYCHOLOGY  
 (AFOSR-TR-94-0469)  
 A AD-A282 942  
 \*F49620-92-J-0314  
 PENNSYLVANIA STATE UNIV  
 UNIVERSITY PARK DEPT OF  
 MECHANICAL ENGINEERING  
 (AFOSR-TR-94-0516)  
 A AD-A284 092  
 \*F49620-92-J-0322  
 CINCINNATI UNIV OH DEPT OF  
 CHEMISTRY  
 (AFOSR-TR-94-0493)  
 A AD-A284 168  
 \*F49620-92-J-0325  
 ARIZONA UNIV TUCSON  
 (AFOSR-TR-94-0491)  
 A AD-A284 165  
 \*F49620-92-J-0333  
 TENNESSEE UNIV KNOXVILLE CENTER  
 FOR ENVIRONMENTAL BIOTECHNOLOGY  
 (AFOSR-TR-94-0494)  
 A AD-A284 170  
 \*F49620-92-J-0347  
 CHICAGO UNIV IL DEPT OF MEDICINE  
 (AFOSR-TR-94-0451)  
 A AD-A283 180  
 \*F49620-92-J-0362  
 ALABAMA UNIV IN BIRMINGHAM  
 (AFOSR-TR-94-0481)  
 F AD-A284 234  
 \*F49620-92-J-0387  
 MASSACHUSETTS UNIV AMHERST  
 (AFOSR-TR-94-0576)

F AD-A284 781  
 \*F49620-92-J-0418  
 CALIFORNIA UNIV DAVIS  
 (AFOSR-TR-94-0537)  
 AD-A284 252  
 \*F49620-92-J-0437  
 RICE UNIV HOUSTON TX  
 (AFOSR-TR-94-0577)  
 A AD-A284 861  
 \*F49620-92-J-0468  
 MISSISSIPPI STATE UNIV MISSISSIPPI  
 STATE  
 (AFOSR-TR-94-0384)  
 A AD-A280 927  
 \*F49620-92-J-0506  
 INDIANA UNIV AT BLOOMINGTON  
 HEARING AND COMMUNICATION LAB  
 (AFOSR-TR-94-0503)  
 A AD-A284 189  
 \*F49620-92-J-0517  
 TORONTO UNIV (ONTARIO) DEPT OF  
 PSYCHOLOGY  
 (AFOSR-TR-94-0374)  
 A AD-A280 977  
 \*F49620-92-J-0533  
 NORTHERN ILLINOIS UNIV DE KALB  
 DEPT OF CHEMISTRY  
 (AFOSR-TR-94-0414)  
 A AD-A281 306  
 \*F49620-92-J-0534  
 INDIANA UNIV AT BLOOMINGTON DEPT  
 OF CHEMISTRY  
 (AFOSR-TR-94-0406)  
 AD-A281 117  
 (AFOSR-TR-94-0404)  
 AD-A281 118  
 (AFOSR-TR-94-0408)  
 AD-A281 119  
 (AFOSR-TR-94-0405)  
 AD-A281 224  
 (AFOSR-TR-94-0403)  
 A AD-A281 308  
 (AFOSR-TR-94-0407)  
 AD-A281 324

\*F49620-93-C-0003  
 ROCKWELL INTERNATIONAL CANOGA  
 PARK CA ROCKETDYNE DIV  
 (AFOSR-TR-94-0475)  
 F AD-A284 213  
 \*F49620-93-C-0028  
 BERKELEY APPLIED SCIENCE AND  
 ENGINEERING INC SAN FRANCISCO CA  
 83-148  
 (AFOSR-TR-94-0411)  
 F AD-A281 301  
 \*F49620-93-C-0034  
 ADVANCED TECHNOLOGY MATERIALS INC  
 DANBURY CT  
 (AFOSR-TR-94-0572)  
 F AD-B189 498L  
 \*F49620-93-C-0036  
 SQM TECHNOLOGY INC LA JOLLA CA  
 SQMT-94-020R  
 (AFOSR-TR-94-0473)  
 F AD-B189 350L  
 \*F49620-93-C-0047  
 SVT ASSOCIATES INC EDEN PRAIRIE  
 MN  
 (AFOSR-TR-94-0433)  
 F AD-B187 142  
 \*F49620-93-C-0052  
 MSNW INC SAN MARCOS CA  
 BS-559  
 (AFOSR-TR-94-0388)  
 F AD-A280 941  
 \*F49620-93-C-0064  
 PHOTONICS RESEARCH INC LONGMONT  
 CO  
 PRIB-TR-94-0004  
 (AFOSR-TR-94-0398)  
 F AD-B186 566L  
 \*F49620-93-I-0040  
 PRINCETON UNIV NJ DEPT OF  
 CHEMICAL ENGINEERING  
 (AFOSR-TR-94-0534)  
 AD-A284 199  
 (AFOSR-TR-94-0533)  
 AD-A284 217

CONTRACT INDEX-4  
 UNCLASSIFIED T4035K

F49-F49

## UNCLASSIFIED

(AFOSR-TR-94-0536)  
 AD-A284 226  
 \*F49620-93-1-0040  
 PRINCETON UNIV NJ DEPT OF  
 CHEMICAL ENGINEERING  
 (AFOSR-TR-94-0535)  
 AD-A284 185  
 \*F49620-93-1-0061  
 VIRGINIA POLYTECHNIC INST AND  
 STATE UNIV BLACKSBURG  
 INTERDISCIPLINARY CENTER FOR  
 APPLIED MATHEMATICS  
 (AFOSR-TR-94-0429)  
 F AD-A282 912  
 \*F49620-93-1-0089  
 DALHOUSIE UNIV HALIFAX (NOVA  
 SCOTIA) DEPT OF PSYCHOLOGY  
 (AFOSR-TR-94-0372)  
 A AD-A280 981  
 \*F49620-93-1-0099  
 HAHNEMANN UNIV PHILADELPHIA PA  
 DEPT OF MENTAL HEALTH SCIENCES  
 (AFOSR-TR-94-0471)  
 A AD-A282 450  
 \*F49620-93-1-0114  
 NORTHWESTERN UNIV EVANSTON IL  
 (AFOSR-TR-94-0416)  
 F AD-A281 283  
 \*F49620-93-1-0127  
 FLORIDA UNIV GAINESVILLE QUANTUM  
 THEORY PROJECT  
 (AFOSR-TR-94-0532)  
 AD-A284 130  
 (AFOSR-TR-94-0530)  
 AD-A284 145  
 FLORIDA UNIV GAINESVILLE  
 (AFOSR-TR-94-0531)  
 AD-A284 434  
 (AFOSR-TR-94-0532)  
 AD-A284 440  
 \*F49620-93-1-0129  
 TENNESSEE UNIV KNOXVILLE DEPT OF  
 CHEMISTRY  
 (AFOSR-TR-94-0496)  
 A AD-A284 171  
 \*F49620-93-1-0132  
 UNIVERSITY OF CENTRAL FLORIDA  
 ORLANDO  
 (AFOSR-TR-94-0418)  
 F AD-A281 448  
 \*F49620-93-1-0136  
 HAHNEMANN UNIV PHILADELPHIA PA  
 (AFOSR-TR-94-0542)  
 A AD-A284 023  
 \*F49620-93-1-0142  
 MISSOURI UNIV-KANSAS CITY DEPT  
 OF CHEMISTRY  
 (AFOSR-TR-94-0546)  
 A AD-A284 400  
 \*F49620-93-1-0145  
 CALIFORNIA UNIV LOS ANGELES DEPT  
 OF CHEMISTRY AND BIOCHEMISTRY  
 (AFOSR-TR-94-0525)  
 AD-A284 143  
 \*F49620-93-1-0148  
 UNIVERSITY OF CENTRAL FLORIDA  
 ORLANDO  
 (AFOSR-TR-94-0449)  
 F AD-A283 200  
 \*F49620-93-1-0158  
 PURDUE RESEARCH FOUNDATION  
 LAFAYETTE IN  
 (AFOSR-TR-94-0387)  
 AD-A280 980  
 \*F49620-93-1-0176  
 CALIFORNIA UNIV SAN DIEGO LA  
 JOLLA DEPT OF CHEMISTRY  
 (AFOSR-TR-94-0396)  
 F AD-A281 311  
 \*F49620-93-1-0178  
 MASSACHUSETTS UNIV AMHERST DEPT  
 OF POLYMER SCIENCE AND  
 ENGINEERING  
 (AFOSR-TR-94-0507)  
 A AD-A284 163  
 \*F49620-93-1-0188  
 CHICAGO UNIV IL DEPT OF MEDICINE  
 (AFOSR-TR-94-0399)  
 F AD-A281 204  
 \*F49620-93-1-0189  
 UNIVERSITY OF SOUTHERN MISSISSIPPI  
 HATTIESBURG  
 (AFOSR-TR-94-0417)  
 A AD-A281 370  
 \*F49620-93-1-0197  
 NEW MEXICO UNIV ALBUQUERQUE DEPT  
 OF CHEMISTRY  
 (AFOSR-TR-94-0447)  
 A AD-A282 789  
 \*F49620-93-1-0199  
 ARIZONA UNIV TUCSON OPTICAL  
 SCIENCES CENTER  
 (AFOSR-TR-94-0432)  
 A AD-A282 781  
 \*F49620-93-1-0202  
 CASE WESTERN RESERVE UNIV  
 CLEVELAND OH DEPT OF PHYSICS  
 (AFOSR-TR-94-0543)  
 A AD-A283 948  
 \*F49620-93-1-0206  
 MINNESOTA UNIV  
 OF PSYCHOLOGY  
 (AFOSR-TR-94-0371)  
 A AD-A280 937  
 \*F49620-93-1-0216  
 AUBURN UNIV AL DEPT OF MATERIALS  
 ENGINEERING  
 (AFOSR-TR-94-0506)  
 A AD-A284 471  
 \*F49620-93-1-0224  
 DUQUESNE UNIV PITTSBURGH PA  
 (AFOSR-TR-94-0395)  
 A AD-A281 307  
 \*F49620-93-1-0232  
 SPERRY RAND CORP GAINESVILLE FL  
 SPERRY MICROWAVE COMPONENTS DIV  
 -1195/94  
 (AFOSR-TR-94-0363)  
 F AD-A280 728

CONTRACT INDEX-5  
 UNCLASSIFIED T4035K

F49-F49

## UNCLASSIFIED

*F49620-93-1-0235 CORNELL UNIV ITHACA NY DEPT OF MATERIALS SCIENCE AND ENGINEERING TR-5	PSYCHOLOGY (AFOSR-TR-94-0499) A AD-A284 101	(AFOSR-TR-94-0410) A AD-A281 350
A AD-A281 352 (AFOSR-TR-94-0412)	*F49620-93-1-0274 SPIE-THE INTERNATIONAL SOCIETY FOR OPTICAL ENGINEERING BELLINGHAM WA (AFOSR-TR-94-0523) F AD-A284 472	*F49620-93-1-0326 CALIFORNIA INST OF TECH PASADENA (AFOSR-TR-94-0445) AD-A283 181
*F49620-93-1-0236 MATERIALS RESEARCH SOCIETY PITTSBURGH PA (AFOSR-TR-94-0574) F AD-A284 898	*F49620-93-1-0286 FLORIDA INST OF TECH MELBOURNE DEPT OF ELECTRICAL AND COMPUTER ENGINEERING ASL-94-001 (AFOSR-TR-94-0521) F AD-A284 191	*F49620-93-1-0327 STATE UNIV OF NEW YORK AT BINGHAMTON (AFOSR-TR-94-0547) A AD-A284 399
*F49620-93-1-0240 UNIVERSITY OF WESTERN ONTARIO LONDON DEPT OF PHYSICS (AFOSR-TR-94-0383) F AD-A280 938	*F49620-93-1-0290 MASSACHUSETTS GENERAL HOSPITAL BOSTON WELLMAN LABS OF PHOTOMEDICINE (AFOSR-TR-94-0464) A AD-A282 599	*F49620-93-1-0331 VIRGINIA UNIV CHARLOTTESVILLE DEPT OF CHEMISTRY (AFOSR-TR-94-0452) A AD-A282 840
*F49620-93-1-0241 ILLINOIS UNIV AT URBANA (AFOSR-TR-94-0446) A AD-A282 969	*F49620-93-1-0292 COLUMBIA UNIV NEW YORK DEPT OF CHEMISTRY (AFOSR-TR-94-0454) A AD-A282 618	*F49620-93-1-0338 CALIFORNIA INST OF TECH PASADENA GRADUATE AERONAUTICAL LABS GALCIT-FM-94-2 (AFOSR-94-0448) A AD-A282 941 (AFOSR-TR-94-0527) AD-A284 197
*F49620-93-1-0245 VIRGINIA UNIV CHARLOTTESVILLE DEPT OF MATERIALS SCIENCE AND ENGINEERING UVA/525771/MSE94/101 (AFOSR-TR-94-0472) F AD-A282 971	*F49620-93-1-0298 TEXAS UNIV MEDICAL SCHOOL AT HOUSTON (AFOSR-TR-94-0385) A AD-A280 928	*F49620-93-1-0368 TEXAS UNIV AT AUSTIN INST FOR GEOPHYSICS (AFOSR-TR-94-0394) A AD-A281 158
*F49620-93-1-0251 CALIFORNIA UNIV IRVINE DEPT OF CHEMISTRY (AFOSR-TR-94-0430) A AD-A282 451	*F49620-93-1-0302 COLORADO STATE UNIV FORT COLLINS DEPT OF ANATOMY AND NEUROBIOLOGY (AFOSR-TR-94-0513) A AD-A284 111	*F49620-93-1-0372 COLORADO UNIV AT BOULDER (AFOSR-TR-94-0459) A AD-A282 598
*F49620-93-1-0255 WASHINGTON STATE UNIV PULLMAN DEPT OF PHYSICS (AFOSR-TR-94-0499) A AD-A284 216	*F49620-93-1-0307 TEXAS UNIV AT AUSTIN (AFOSR-TR-94-0504) A AD-A284 162	*F49620-93-1-0373 UNIVERSITY OF SOUTHERN CALIFORNIA LOS ANGELES DEPT OF AEROSPACE ENGINEERING (AFOSR-TR-94-0579) A AD-A284 727
*F49620-93-1-0261 PITTSBURGH UNIV PA (AFOSR-TR-94-0510) A AD-A284 103	*F49620-93-1-0314 CALIFORNIA INST OF TECH PASADENA	*F49620-93-1-0396 MASSACHUSETTS UNIV AMHERST DEPT OF POLYMER SCIENCE AND ENGINEERING
*F49620-93-1-0273 YALE UNIV NEW HAVEN CT DEPT OF		

CONTRACT INDEX-6  
UNCLASSIFIED T4035K

F49-F49

UNCLASSIFIED

(AFOSR-TR-94-0512)  
A AD-A284 215  
\*F49620-93-1-0402  
CALIFORNIA UNIV SAN DIEGO LA  
JOLLA DEPT OF PSYCHIATRY  
(AFOSR-TR-94-0514)  
A AD-A284 100  
\*F49620-93-1-0414  
CORNELL UNIV ITHACA NY DIV OF  
BIOLOGICAL SCIENCES  
(AFOSR-TR-94-0492)  
A AD-A284 164  
\*F49620-93-1-0434  
MASSACHUSETTS GENERAL HOSPITAL  
BOSTON  
(AFOSR-TR-94-0495)  
A AD-A284 167  
\*F49620-93-1-0454  
PRINCETON UNIV NJ DEPT OF  
CHEMICAL ENGINEERING  
(AFOSR-TR-94-0534)  
AD-A284 199  
(AFOSR-TR-94-0533)  
AD-A284 217  
\*F49620-93-1-0463  
TENNESSEE UNIV KNOXVILLE DEPT OF  
CHEMISTRY  
(AFOSR-TR-94-0580)  
A AD-A284 859  
\*F49620-94-1-0009  
MINNESOTA UNIV MINNEAPOLIS INST  
FOR MATHEMATICS AND ITS  
APPLICATIONS  
IMA-1  
(AFOSR-TR-94-0520)  
F AD-A284 192  
\*F49620-94-1-0073  
CALIFORNIA UNIV IRVINE DEPT OF  
COGNITIVE SCIENCES  
(AFOSR-TR-94-0470)  
F AD-A282 928  
\*F49620-94-1-0082  
MONTANA STATE UNIV BOZEMAN DEPT

OF CHEMISTRY  
(AFOSR-TR-94-0497)  
A AD-A284 172  
\*NSF-DMR89-15440  
INDIANA UNIV AT BLOOMINGTON DEPT  
OF CHEMISTRY  
(AFOSR-TR-94-0407)  
AD-A281 324

CONTRACT INDEX-7  
UNCLASSIFIED T4035K

F49-\$NS

**PERSONAL AUTHOR INDEX**

## UNCLASSIFIED

## PERSONAL AUTHOR INDEX

\*ACEVES, ALEJANDRO@@@  
\* \* \*  
Light Beam and Pulse Propagation in  
Nonlinear Dielectrics.  
AD-A282 548

\*ACKERMAN, PHILLIP L  
\* \* \*  
Cognitive/Self-Regulatory Aptitudes  
and Instructional Methods for  
Complex Skill Learning.  
AD-A280 937

\*ADAMS, W. P  
\* \* \*  
Polyhedral Approaches for Solving O-  
1 Polynomial Programming Problems.  
AD-A282 448

\*AIKAWA, MASAYUKI  
\* \* \*  
Electron Transport Reactions  
between Pyrene and Methylviologen  
in a Model Biological Membrane.  
AD-A283 184

\*ANDERSON, MARK S  
\* \* \*  
Shaped Strain Sensors for  
Intelligent Structures.  
AD-A282 333

\*ANDERSON, WILLIAM E.@@  
\* \* \*  
Combustion Instability Phenomena of  
Importance to Liquid Propellant  
Engines.  
AD-A284 780

\*ANDREWS, LESTER@@@@@  
\* \* \*  
Boron Atom Matrix Chemistry.  
AD-A282 840

\*APKARIAN, V. A  
\* \* \*  
Advanced Cryogenic Propellants.  
AD-A282 451

\*ARMSTRONG, N.@@  
\* \* \*

New Mechanisms and New Materials  
for Organic Optical Nonlinearity.  
AD-A282 781

\*ASTON-JONES, GARY@  
\* \* \*  
Locus Coeruleus, Vigilance and  
Stress: Brain Mechanisms of  
Adaptive Behavioral Responsiveness.  
AD-A282 450

\*AURICCHIO, F.@@  
\* \* \*  
Structural Integrity of Intelligent  
Materials and Structures.  
Constitutive Modeling of Shape  
Memory Alloys.  
AD-A281 301

\*AVDIEVICH, NIKOLAI I  
\* \* \*  
Exchange Interaction in Micellized  
Radical Pairs.  
AD-A283 195

\*BAJAJ, KRISHAN K.@@  
\* \* \*  
Magneto-Optical Properties of  
Quantum Structures with Reduced  
Dimensionality.  
AD-A282 597

\*BAKER, ROBERT M  
\* \* \*  
Fundamentals of Astrodynamics.  
AD-B189 080

\*BARTLETT, RODNEY J.@@@  
\* \* \*  
A Theoretical Study of Hyperfine  
Coupling Constants.  
AD-A284 440

\*BARTLETT, RODNEY J.@@  
\* \* \*  
Relativistic Effects at the  
Correlated Level. An Application to  
Interhalogens,  
AD-A284 145

Theoretical Determination of Charge-

Transfer and Ligand Field  
Transition Energies for FeCl<sub>4</sub> -  
Using the EDM-CCSD Method,  
AD-A284 198

\*BARTLETT, RODNEY J.@@  
\* \* \*  
Coupled-Cluster Calculations of  
Indirect Nuclear Coupling  
Constants: The Importance of Non-  
Fermi Contact Contributions,  
AD-A284 130

Accurate Electron Affinities of  
Small Carbon Clusters,  
AD-A284 434

\*BEAVER, BRUCE@  
\* \* \*  
Development of Oxygen Scavenger  
Additives for Jet Fuels.  
AD-A281 307

\*BEHRENS, H. W.@@@  
\* \* \*  
Theoretical and Experimental  
Studies of Laser-Initiated  
Detonation Waves for Supersonic  
Combustion,  
AD-A280 984

\*BERRY, K. R  
\* \* \*  
Photodissociation Spectroscopy of  
Mg+ -Rare Gas Complexes,  
AD-A283 194

\*BHATTACHARYA, PRABIR  
\* \* \*  
A New Multi-Dimensional Transform  
for Digital Signal Processing Using  
Generalized Association Schemes.  
AD-A284 166

\*BIANCONI, PATRICIA A.@@@  
\* \* \*  
Fabrication of Biomimetic Molecular  
Level Composites.  
AD-A284 204

\*BIERBAUM, VERONICA M

PERSONAL AUTHOR INDEX-1  
UNCLASSIFIED T4035K



## UNCLASSIFIED

\* \* \*  
 Vibrational Specificity for Charge  
 Transfer Versus Deactivation in  
 $N_2(V = 0, 1, 2) + Ar$  and  $O_2$   
 Reactions,  
 AD-A284 200  
 \*BIERBAUM, VERONICA M.@@  
 \* \* \*  
 Reactions of Atmospheric Cluster  
 Ions.  
 AD-A282 598  
 \*BING, GUOYING \* \* \*  
 Measurement and Regulation of  
 Central Noradrenergic Receptors.  
 AD-A284 219  
 \*BINTZ, KAREN L \* \* \*  
 Classical Intramolecular Energy-  
 Transfer Rates Using Fourier  
 Transform Methods: Four-Atom  
 Systems,  
 AD-A284 113  
 \*BLAKE, ROBERT, II@ \* \* \*  
 Biotransformation of Toxic Metals  
 by Bacteria.  
 AD-A280 893  
 \*BOHLING, GEOFFREY C \* \* \*  
 Characterization of Heterogeneities  
 Controlling Transport and Fate of  
 Pollutants in Unconsolidated Sand  
 and Gravel Aquifers: Third Year  
 Report.  
 AD-A284 193  
 \*BOVIK, ALAN \* \* \*  
 Local Spatio-Temporal Analysis in  
 Vision Systems.  
 AD-A284 162  
 \*BOWERS, MICHAEL T \* \* \*  
 Cluster Ions.  
 AD-A282 615  
 \*BOYD, I \* \* \*  
 Hypervelocity Air Flows With Finite  
 Rate Chemistry.  
 AD-A284 727  
 \*BRILL, J. W \* \* \*  
 Electric Field Dependence of  
 Young's Modulus of (TMTSF)2PF6,  
 AD-A281 324  
 \*BRILL, J. W.@@@ \* \* \*  
 AC Calorimetry at CDW and SDW  
 transitions,  
 AD-A281 117  
 \*BRILL, J. W.@@@ \* \* \*  
 Thermodynamics of the Anion  
 Ordering Transitions in  
 (TMTSF)2ReO4 and (TMTSF)2BF4,  
 AD-A281 119  
 \*BRYAN, ROBERT \* \* \*  
 Photonic Computer Links Using Multi-  
 Channel Vertical-Cavity Surface-  
 Emitting Laser Arrays.  
 AD-B186 566L  
 \*BUCHACHENKO, ANATOLII L \* \* \*  
 Paramagnetic Interactions of  
 Triplet Radical Pairs with Nitroxide  
 Radicals: An 'Antiscavenging'  
 Effect.  
 AD-A282 855  
 \*BUESKING, KENT W.@@@@@ \* \* \*  
 Structural Integrity of Intelligent  
 Materials and Structures.  
 AD-A280 941  
 \*BURGIN, T \* \* \*  
 The Synthesis and Characterization  
 of Radical Cation Salts of  
 Bis(Ethylenedithio)Tetraselenafulval  
 ene,  
 AD-A281 118  
 \* \* \*  
 Synthesis, Superconductivity, X-ray  
 Structure and Electronic Band  
 Structure of Wavelengths-  
 (BETS)2GaCl4,  
 AD-A281 224  
 \* \* \*  
 Electric Field Dependence of  
 Young's Modulus of (TMTSF)2PF6,  
 AD-A281 324  
 \*BUTLER, JAMES J., JR \* \* \*  
 Characterization of Heterogeneities  
 Controlling Transport and Fate of  
 Pollutants in Unconsolidated Sand  
 and Gravel Aquifers: Third Year  
 Report.  
 AD-A284 193  
 \*CALL, C. J \* \* \*  
 A Technique for Measuring  
 Lagrangian and Eulerian Particle  
 Statistics in a Turbulent Flow,  
 AD-A280 932  
 \* \* \*  
 Measurements and Simulations of  
 Particle Dispersion in a Turbulent  
 Flow,  
 AD-A280 973  
 \* \* \*  
 Measurements of Droplet Dispersion  
 in Heated and Unheated Turbulent  
 Jets.  
 AD-A284 252  
 \*CANDLER, G. V \* \* \*  
 Interaction of Chemistry,  
 Turbulence, and Shock Waves in  
 Hypervelocity Flow.  
 AD-A282 941  
 \*CAREW, THOMAS J.@@ \* \* \*  
 A Parallel Processing Hypothesis

PERSONAL AUTHOR INDEX-2  
 UNCLASSIFIED T4035K

BIE-CAR



# UNCLASSIFIED

for Short-Term and Long-Term Memory  
in Aplysia.

AD-A284 101

\*CARLSON, K. D

The Synthesis and Characterization  
of Radical Cation Salts of  
Bis(Ethyleneedithio)Tetraethylenefulvalene,  
AD-A281 118

\*CARL, JAMES A.@@@

Visuo-Ocular Performance During  
Vestibular Stimulation.  
AD-A284 103

\*CARTER, EMILY A.@@

First-Principles-Derived Rate  
Constants for H Adatom Surface  
Diffusion on Si(100)-2x1,  
AD-A284 143

\*CASSONE, VINCENT M

Graduate Student Training in  
Chronobiology. (FY91 Assert). The  
Suprachiasmatic Nucleus Controls  
the Circadian Rhythm of Heart Rate  
Via the Sympathetic Nervous System.  
AD-A284 132

\*CAVANAGH, PATRICK@@@

Cooperativity and 3-D  
representation.  
AD-A284 203

\*CHAMBERS, JANICE E.@@@

Structure-Activity Relationships of  
Chlorinated Alicyclic Compounds in  
Catfish.  
AD-A280 927

\*CHAMPNEY, THOMAS H.@@@

Graduate Student Training in  
Chronobiology. (FY91 Assert). The

Suprachiasmatic Nucleus Controls  
the Circadian Rhythm of Heart Rate  
Via the Sympathetic Nervous System.  
AD-A284 132

\*CHANG, XIAO Y

Classical Intramolecular Energy-  
Transfer Rates Using Fourier  
Transform Methods: Four-Atom  
Systems,  
AD-A284 113

\*CHOU, MAU-SONG

Theoretical and Experimental  
Studies of Laser-Initiated  
Detonation Waves for Supersonic  
Combustion,  
AD-A280 984

\*CHOW, PETER@@@

Quantum Well and Superlattice IR  
detector Development. Phase 1.  
AD-B187 142

\*CHUNG, M

AC Calorimetry at CDW and SDW  
transitions,  
AD-A281 117

Thermodynamics of the Anion

Ordering Transitions in  
(TMTSF)2ReO4 and (TMTSF)2BF4,  
AD-A281 119

\*COLKET, MERIDETH B., III

Mechanistic Models of Soot  
Formation.  
AD-A284 257

\*CONGER, K. A.@@

Cumulative Effects of Repeated  
Brief Cerebral Ischemia.  
AD-A284 234

\*COOPER, B. H.@@@

PERSONAL AUTHOR INDEX-3  
UNCLASSIFIED T4035K

Resonant Charge Transfer in  
Hyperthermal Atomic and Molecular  
Ion-Surface Collisions.  
AD-A281 369

\*CORMACK, LAWRENCE

Local Spatio-Temporal Analysis in  
Vision Systems.  
AD-A284 162

\*CRAWLEY, EDWARD@@@

Shaped Strain Sensors for  
Intelligent Structures.  
AD-A282 333

\*DAGENAIS, M.@@

Wavelength-Encoded Processing in  
Semiconductor Lasers.  
AD-A282 649

\*DEBENEDETTI, PABLO G.@@@

Supercritical Fluids in Particle  
Formation Media,  
AD-A284 217

Solute-Solute Interactions: Theory  
and Simulations,  
AD-A284 226

\*DEBENEDETTI, PABLO G.@@

Integral Equation Study of  
Microstructure and Solvation in  
Model Attractive and Repulsive  
Supercritical Mixtures.  
AD-A284 185

Precipitation of Poly(L-Lactic  
Acid) and Composite Poly(L-Lactic  
Acid)-Pyrene Particles by Rapid  
Expansion of Supercritical  
Solutions,  
AD-A284 199

\*DEFACIO, BRIAN@@@

CAR-DEF

# UNCLASSIFIED

Wavelets and Scattering.

AD-A284 131

\*DEUTSCH, T. F

Ultrashort Laser Pulse Effects in  
Ocular and Related Media: Laser-  
Induced Shock Wave Propagation and  
Retinal Damage.

AD-A282 599

\*DIMOTAKIS, P. E

Interaction of Chemistry,  
Turbulence, and Shock Waves in  
Hypervelocity Flow.

AD-A282 941

\*DOLLAR, MAREK

Processing and Characterization of  
Mechanically Alloyed NiAl-Based  
Alloys.

AD-A283 959

\*DOREY, K

Ultrashort Laser Pulse Effects in  
Ocular and Related Media: Laser-  
Induced Shock Wave Propagation and  
Retinal Damage.

AD-A282 599

\*DOUKAS, A. G

Ultrashort Laser Pulse Effects in  
Ocular and Related Media: Laser-  
Induced Shock Wave Propagation and  
Retinal Damage.

AD-A282 599

\*DUDEK, F. E

Cellular Neurophysiology of the Rat  
Suprachiasmatic Nucleus: Electrical  
Properties, Neurotransmission, and  
Mechanisms of Synchronization.

AD-A284 111

\*DUDEK, J. D. @@@@

\*\*\*

The Synthesis and Characterization  
of Radical Cation Salts of  
Bis(Ethylenedithio)Tetraselenafulval  
ene,

AD-A281 118

\*DUNCAN, MICHAEL A

Photogeneration and  
Characterization of Energetic  
Molecules in Supersonic Molecular  
Beams.

AD-A284 108

\*DUNCAN, M. A. @@@@

\*\*\*

Photodissociation Spectroscopy of  
Mg<sup>+</sup> -Rare Gas Complexes,

AD-A283 194

\*DVORAK, RUDOLF

\*\*\*

Transonic Flow Separation in Closed  
Curved Channels.

AD-A280 728

\*DYMEK, STANISLAW

\*\*\*

Processing and Characterization of  
Mechanically Alloyed NiAl-Based  
Alloys.

AD-A283 959

\*EARNEST, DAVID

\*\*\*

Transplantations and Cloning of an  
Immortal Cell Line from Rat SCN.

AD-A280 978

\*EARTHMAN, JAMES C

\*\*\*

High Temperature Fracture  
Mechanisms in Metallic Matrix  
Composites Produced by  
Solidification Techniques.

AD-A284 169

\*ERICKSON, MATTHEW G

\*\*\*

Laser Spectroscopy of Gdo: Ligand  
Field Assignments of 4f7(8S)6p

PERSONAL AUTHOR INDEX-4

UNCLASSIFIED

T4035K

Reversing 4f7(8)6s Transitions,  
AD-A282 827

\*FENDELL, F

\*\*\*

Laser-Initiated Conical Detonation  
Wave for Supersonic Combustion. 2,  
AD-A280 985

\*FENDELL, FRANCIS E

\*\*\*

Theoretical and Experimental  
Studies of Laser-Initiated  
Detonation Waves for Supersonic  
Combustion,  
AD-A280 984

\*FIELD, ROBERT W

\*\*\*

Large Amplitude Motions, Especially  
Isomerization and Tunneling in  
Polyatomic Molecule Spectra: Novel  
Experimental, Pattern Recognition,  
and Theoretical Methods.

AD-A284 194

\*FIGUEROA, E

\*\*\*

Thermodynamics of the Anion  
Ordering Transitions in  
(TMTSF)2ReO4 and (TMTSF)2BF4,  
AD-A281 119

\*FLEMING, WENDELL H

\*\*\*

Stochastic Control and Nonlinear  
Estimation.

AD-A281 219

\*FLOTTE, T

\*\*\*

Ultrashort Laser Pulse Effects in  
Ocular and Related Media: Laser-  
Induced Shock Wave Propagation and  
Retinal Damage.

AD-A282 599

\*FOOTE, STEPHEN L. @

\*\*\*

Extrathalamic Modulation of  
Cortical Responsiveness.

DEU-F00

# UNCLASSIFIED

AD-A284 100

\*FREIMAN, CHARLES V.@@@

Air Force Engineering Research  
Initiation Grant Program.  
AD-A284 028

\*FRIEDMAN, AVNER

Finite Markov Chains and Random  
Discrete Structures.  
AD-A284 192

\*FROHLICH, CLIFF@@@

AASERT-92 Observational Analysis of  
the Origin of Non-Double Couple  
Seismic Sources.  
AD-A281 158

\*FROST, MICHAEL J

Vibrational Specificity for Charge  
Transfer Versus Deactivation in  
 $N_2^+(V = 0, 1, 2) + Ar$  and  $O_2$   
Reactions,  
AD-A284 200

\*FURMAN, JOSEPH M

Visuo-Ocular Performance During  
Vestibular Stimulation.  
AD-A284 103

\*GALLATIN, GREGG@@

Enhanced Quantum Dot Nonlinear  
Optical Materials.  
AD-B187 187

\*GANNON, ROBERT@@@

Transplantations and Cloning of an  
Immortal Cell Line from Rat SCN.  
AD-A280 978

\*GEISLER, WILSON S

Local Spatio-Temporal Analysis in  
Vision Systems.

AD-A284 162

\*GERBER, R. B

Advanced Cryogenic Propellants.  
AD-A282 451

\*GERMAIN, PATRICK@@

Hypervelocity Flow Simulation,  
AD-A284 197

\*GEVINS, A. S.@@@

Signet-Software Tools for Signal  
Identification Using Neural  
Networks.  
AD-A284 362

\*GHATLIA, NARESH D

Exchange Interaction in Micellized  
Radical Pairs.  
AD-A283 195

\*GHOSH, JOYDEEP

Local Spatio-Temporal Analysis in  
Vision Systems.  
AD-A284 162

\*GILDEEN, DAVID@@@

Local Spatio-Temporal Analysis in  
Vision Systems.  
AD-A284 162

\*GILSON, RICHARD D

Situational Awareness in Complex  
Systems.  
AD-A281 448

\*GLENBERG, ARTHUR M.@@@

Processes Involved in the  
Integration of Pictures and  
Discourse.  
AD-A282 942

\*GREENWOOD, DAN

PERSONAL AUTHOR INDEX-5  
UNCLASSIFIED T4035K

\* \* \*

Microcomputer-Based Aircraft  
Routing and Scheduling. Phase 2.  
AD-A282 930

\*GREEN, CAROL E.@@@

In Vitro System for Studying  
Metabolism of Environmental  
Chemicals in Human Cells.  
AD-A284 174

\*GRUBIN, HAROLD L

Numerical Studies of Low  
Temperature Gallium Arsenide Buffer  
Layers and Their Influence on  
Device Operation.  
AD-A281 156

\*GRUBIN, HAROLD L. @

Large Signal Time Dependent Quantum  
Mechanical Transport in Quantum  
Phase Based Devices.  
AD-A283 338

\*GUNZBURGER, MAX D

Computational Methods for PDEs in  
Flow Control, Superconductivity,  
Fluid Flows and Other Applications.  
AD-A282 912

\*GUO, YIN

A Full-Dimensional Semiclassical  
Calculation of Vibrational Mode  
Selectivity in the Tunneling  
Splitting in a Planar Model of  
Malonaldehyde,  
AD-A284 772

\*GYLYS, V. T

NCL(B) Based Short Wavelength  
Chemical Laser.  
AD-A284 213

\*HALL, ROBERT J

\* \* \*

FRE-HAL

## UNCLASSIFIED

Mechanistic Models of Soot Formation.  
AD-A284 257

\*HAMPDEN-SMITH, M. J.@@

Hydrolysis and Condensation of Tin (IV) Alkoxide Compounds: The Control of Structural Evolution.  
AD-A282 789

\*HANNSGEN, KENNETH B

Energy Decay and Control for Elastic and Viscoelastic Distributed Parameter Systems.  
AD-A281 312

\*HANSELL, D

A Simulation of Particle Dispersion in a Turbulent Jet.  
AD-A280 930

\*HANSON, R

Hypervelocity Air Flows With Finite Rate Chemistry.  
AD-A284 727

\*HEAVEN, MICHAEL C

Spectroscopy of Metastable Species in a Free-Jet Expansion: The D' to A' (Reverse) Transition of IBr.  
AD-A282 563

The Role of Excited Molecular Iodine in the Chemical Oxygen Iodine Laser,  
AD-A282 735

Laser Spectroscopy of Gdo: Ligand Field Assignments of 4f7(8S)6p Reversing 4f7(8)6s Transitions,  
AD-A282 827

\*HEAVEN, MICHAEL C.@@

Laser Spectroscopy of UO: characterization and Assignment of

States in the 0- to 3-eV Range, with a Comparison to the Electronic Structure of ThO.  
AD-A282 546

\*HEEGER, ALAN J.@@

Conjugated Polymers with Degenerate Ground State: The Route to High Performance NLO Response. (F91 ASSERT).

AD-A283 958

\*HETHERINGTON, H. P

Cumulative Effects of Repeated Brief Cerebral Ischemia.  
AD-A284 234

\*HINDY, R. N.@@

NCL(B) Based Short Wavelength Chemical Laser.  
AD-A284 213

\*HOLDEN, M

Hypervelocity Air Flows With Finite Rate Chemistry.  
AD-A284 727

\*HOLDER, ANDREW J.@@

SAM1 Semiempirical Parameters.  
AD-A284 400

\*HORNUNG, HANS

Hypervelocity Flow simulation,  
AD-A284 197

\*HORNUNG, H. G

Interaction of Chemistry, Turbulence, and Shock Waves in Hypervelocity Flow.  
AD-A282 941

\*HRYCIW, ROMAN D

Interface Mechanics of Particulate

PERSONAL AUTHOR INDEX-6  
UNCLASSIFIED T4035K

Media with Ribbed Inclusions.  
AD-A283 957

\*HUFFMAN, J. C

The Synthesis and Characterization of Radical Cation Salts of Bis(Ethylenedithio)Tetraselenafulvalene,  
AD-A281 118

Synthesis, Superconductivity, X-ray Structure and Electronic Band Structure of Wavelengths-(BETS)2GaCl4,  
AD-A281 224

\*HWANG, SEUNG-UJON

Processing and Characterization of Mechanically Alloyed NiAl-Based Alloys.  
AD-A283 959

\*IONOVA, IRINA V

First-Principles-Derived Rate Constants for H Adatom Surface Diffusion on Si(100)-2x1,  
AD-A284 143

\*IRSYAM, MASYHUR@@@

Interface Mechanics of Particulate Media with Ribbed Inclusions.  
AD-A283 957

\*ISHIGURO, KATSUYA@@@

Electron Transport Reactions between Pyrene and Methylviologen in a Model Biological Membrane.  
AD-A283 184

\*JACQUES, STEVEN L

Theoretical Modeling of Ocular Tissue Damage by Short Pulse Laser.  
AD-A280 928

\*JANDA, K. C

HAM-JAN

## UNCLASSIFIED

\* \* \*  
Advanced Cryogenic Propellants.  
AD-A282 451

\*JEWELL, JACK

\* \* \*  
Photonic Computer Links Using Multi-Channel Vertical-Cavity Surface-Emitting Laser Arrays.  
AD-B186 566L

\*JOHNSTON, SHAYNE@@@

\* \* \*  
Mathematical Analysis of Three Free-Electron-Laser Issues.  
AD-A284 122

\*JONAS, JIRI@@

\* \* \*  
Materials Degradation and Fatigue Under Extreme Conditions.  
AD-A282 969

\*KALEDIN, LEONID A

\* \* \*  
Laser Spectroscopy of UO:  
characterization and Assignment of States in the 0- to 3-eV Range, with a Comparison to the Electronic Structure of ThO.  
AD-A282 546

\* \* \*  
Laser Spectroscopy of Gd: Ligand Field Assignments of 4f7(8S)6p Reversing 4f7(8)6s Transitions,  
AD-A282 827

\*KANFER, RUTH@@@

\* \* \*  
Cognitive/Self-Regulatory Aptitudes and Instructional Methods for Complex Skill Learning.  
AD-A280 937

\*KARASZ, FRANK E.@@

\* \* \*  
Multi-Functional pi-Conjugated Macromolecules Based on Poly(Phenylene Vinylene).  
AD-A284 163

\* \* \*

AASERT 92 - Synthesis and Properties of Complex Polyarylene Vinylenes.  
AD-A284 215

\*KATO, SHUJI

\* \* \*  
Vibrational Specificity for Charge Transfer Versus Deactivation in  $N_2^+(v = 0, 1, 2) + Ar$  and  $O_2$  Reactions,  
AD-A284 200

\*KELLER, JOSEPH

\* \* \*  
Mathematical Problems of Nonlinear Wave Propagation and of Waves in Heterogeneous Media.  
AD-A282 217

\*KENNEDY, I. M

\* \* \*  
A Simulation of Particle Dispersion in a Turbulent Jet,  
AD-A280 930

\*KENNEDY, I. M.@@@

\* \* \*  
A Technique for Measuring Lagrangian and Eulerian Particle Statistics in a Turbulent Flow,  
AD-A280 932

\* \* \*  
Measurements and Simulations of Particle Dispersion in a Turbulent Flow,  
AD-A280 973

\* \* \*  
Measurements of Droplet Dispersion in Heated and Unheated Turbulent Jets.  
AD-A284 252

\*KIRCHMEIER, ROBERT L. @

\* \* \*  
Research on Organofluorine Chemistry for 700 Degrees F thermooxidative Stability.  
AD-A282 767

\*KOLLMANN, W.@@@

PERSONAL AUTHOR INDEX-7  
UNCLASSIFIED T4035K

\* \* \*  
A Simulation of Particle Dispersion in a Turbulent Jet,  
AD-A280 930

\*KOTIUGA, P. R.@@@

\* \* \*  
Geometrical and Topological Methods in Time Domain Antenna Synthesis.  
AD-A284 208

\*KRESKOVSKY, JOHN P.@@@

\* \* \*  
Numerical Studies of Low Temperature Gallium Arsenide Buffer Layers and Their Influence on Device Operation.  
AD-A281 156

\*KUMMEL, ANDREW C. @

\* \* \*  
Chemisorption Energetics of Superactive Chlorine Containing Species on Gallium Arsenide Surfaces.  
AD-A281 311

\*KUNC, J

\* \* \*  
Hypervelocity Air Flows With Finite Rate Chemistry.  
AD-A284 727

\*KUO, Y. -K

\* \* \*  
Thermodynamics of the Anion Ordering Transitions in (TMTSF)2ReO4 and (TMTSF)2BF4,  
AD-A281 119

\*KUSHNER, HAROLD J.@@@

\* \* \*  
Stochastic Control and Nonlinear Estimation.  
AD-A281 219

\*KUZYK, MARK G.@@@

\* \* \*  
Polymer Fibers for Nonlinear Optics.  
AD-A284 216

JEW-KUZ

## UNCLASSIFIED

\*LACKRITZ, HILARY S.@@@@

\* \* \*

Nonlinear Optical and Charge  
Distribution Studies Probing  
Electric Field Effects in Polymer  
Thin Films for Second Order  
Nonlinear Optics.  
AD-A280 980

\*LAGOW, RICHARD J.@

\* \* \*

Elemental Fluorine Based Syntheses  
of Pentafluoro Phenyl and other  
Aromatic Perfluoropolyether  
Polymers.  
AD-A284 102

\*LANDIS, WAYNE G.@

\* \* \*

Development of Techniques for the  
Evaluation of Toxicant Impacts to  
Multispecies Systems.  
AD-A284 426

\*LANGE, FRED F.@@@

\* \* \*

High Temperature Stability of  
Binary Microstructures Derived from  
Liquid Precursors.  
AD-A283 960

\*LAQUER, H. L.@@@@

\* \* \*

High Temperature Superconductors  
with Improved Current Densities.  
AD-A282 996

\*LAVERNIA, ENRIQUE J.@

\* \* \*

High Temperature Fracture  
Mechanisms in Metallic Matrix  
Composites Produced by  
Solidification Techniques.  
AD-A284 169

\*LAWTON, TERI B.@

\* \* \*

Computational Vision Based on  
Neurobiology.  
AD-A284 472

\*LAW, C. K.@

\* \* \*

Studies on high Pressure and  
Unsteady Flame Phenomena.  
AD-A284 126

\*LEE, S.@@@@

\* \* \*

Ultrashort Laser Pulse Effects in  
Ocular and Related Media: Laser-  
Induced Shock Wave Propagation and  
Retinal Damage.  
AD-A282 599

\*LEE, T.-W

\* \* \*

Spatially Resolved Measurements of  
Soot Volume Fraction Using Laser-  
Induced Incandescence.  
AD-A282 562

\*LEONARD, A

\* \* \*

Interaction of Chemistry,  
Turbulence, and Shock Waves in  
Hypervelocity Flow.  
AD-A282 941

\*LEONE, STEPHEN R

\* \* \*

Reactions of Atmospheric Cluster  
Ions.  
AD-A282 598

\*LEONE, STEPHEN R.@

\* \* \*

Vibrational Specificity for Charge  
Transfer Versus Deactivation in  
 $N_2^+(V = 0, 1, 2) + Ar$  and  $O_2$   
Reactions,  
AD-A284 200

\*LEONG, H. M

\* \* \*

Signal-Software Tools for Signal  
Identification Using Neural  
Networks.  
AD-A284 362

\*LIBBY, P. A

\* \* \*

PERSONAL AUTHOR INDEX-8  
UNCLASSIFIED T4035K

Theories of Turbulent Combustion in  
High Speed Flows.  
AD-A280 933

\*LI, YI-QUN@@@

\* \* \*

'Superconductor Magnetic Memory'.  
AD-B189 498L

\*LOOK, DAVID C

\* \* \*

Low Temperature Grown and Highly  
Non-Stoichiometric GaAs and Related  
Materials.  
AD-A284 898

\*MACKENZIE, JOHN D

\* \* \*

International Collaboration Program  
in Innovative Chemical Processing  
of Superior Electronic and Optical  
Materials.  
AD-A282 946

\*MACPHERSON, GWENDOLYN L

\* \* \*

Characterization of Heterogeneities  
Controlling Transport and Fate of  
Pollutants in Unconsolidated Sand  
and Gravel Aquifers: Third Year  
Report.  
AD-A284 193

\*MADSEN, EUGENE

\* \* \*

Research Training For Understanding  
the Fate of Environmental  
Pollutants. (FY91 AASERT).  
AD-A284 164

\*MADSEN, EUGENE L.@

\* \* \*

Geochemical, Genetic and  
Physiological Control of Pollutant  
Biodegradation.  
AD-A280 931

\*MAKEMSON, MAUD W.@

\* \* \*

Fundamentals of Astrodynamics.  
AD-B189 080

LAC-MAK



## UNCLASSIFIED

\*MAMANTOV, GLEB \* \* \*  
Spectroelectrochemical  
Investigations of Molten Halide  
Solutions.  
AD-A284 147

\* \* \*  
Electrochemical and Spectroscopy  
Studies of Selected Inorganic and  
Organic Systems in Molten Halides.  
AD-A284 171

\* \* \*  
AASERT-93: Electroplating of  
Refractory Metals Using  
Halocaluminate Melts.  
AD-A284 859

\*MARDER, SETH@@ \* \* \*  
Materials for Second and Third  
Order Nonlinear Optical  
Applications.  
AD-A281 304

\* \* \*  
Systematic Optimization of Second  
Order Nonlinear Optical Materials.  
AD-A281 350

\*MARKS, T. J \* \* \*  
Rational Design, Construction, and  
Processing of High-Performance  
Nonlinear, Optical Materials.  
AD-A281 283

\*MARK, JAMES E.@@@ \* \* \*  
Novel Polymeric Composites Through  
Molecular Engineering.  
AD-A284 168

\*MASUD, A \* \* \*  
Structural Integrity of Intelligent  
Materials and Structures.  
Constitutive Modeling of Shape  
Memory Alloys.  
AD-A281 301

\*MAURITZ, KENNETH A \* \* \*

Property Control of (Perfluorinated  
Ionomer)/(Inorganic Oxide)  
Composites by Tailoring the  
Nanoscale Morphology.  
AD-A281 370

\*MAZUMDAR, S \* \* \*  
New Mechanisms and New Materials  
for Organic Optical Nonlinearity.  
AD-A282 781

\*MCCORD, JOHN E \* \* \*  
Laser Spectroscopy of UO:  
Characterization and Assignment of  
States in the 0- to 3-ev Range,  
with a Comparison to the Electronic  
Structure of ThO.  
AD-A282 546

\*MCCREERY, RICHARD L.@@ \* \* \*  
In Situ Laser Activation of  
Electrochemical Kinetics at Carbon  
Electrodes.  
AD-A280 892

\*MCLEWEE, CARL D \* \* \*  
Characterization of Heterogeneities  
Controlling Transport and Fate of  
Pollutants in Unconsolidated Sand  
and Gravel Aquifers: Third Year  
Report.  
AD-A284 193

\*MCGREGOR, R \* \* \*  
Laser-Initiated Conical Detonation  
Wave for Supersonic Combustion. 2,  
AD-A280 985

\*MEHROTRA, YOGESH \* \* \*  
Enhanced Quantum Dot Nonlinear  
Optical Materials.  
AD-B187 187

\*WEIRON, D. I.@@@ \* \* \*

Interaction of Chemistry,  
Turbulence, and Shock Waves in  
Hypervelocity Flow.  
AD-A282 941

\*MELLOCH, MICHAEL R.@ \* \* \*  
Low Temperature Grown and Highly  
Non-Stoichiometric GaAs and Related  
Materials.  
AD-A284 898

\*MENNICKE, CHRISTINE M.@@@ \* \* \*  
Characterization of Heterogeneities  
Controlling Transport and Fate of  
Pollutants in Unconsolidated Sand  
and Gravel Aquifers: Third Year  
Report.  
AD-A284 193

\*MILLER, WILLARD, JR@ \* \* \*  
Finite Markov Chains and Random  
Discrete Structures.  
AD-A284 192

\*MINTON, G \* \* \*  
Electric Field Dependence of  
Young's Modulus of (TMTSF)2PF6,  
AD-A281 324

\*MITCHELL, J \* \* \*  
Laser-Initiated Conical Detonation  
Wave for Supersonic Combustion. 2,  
AD-A280 985

\*MITCHELL, J. B.@@@ \* \* \*  
Atomic Processes Relevant to  
Antimatter Fuel Production and  
Storage.  
AD-A280 938

\*MONTGOMERY, LAWRENCE K.@ \* \* \*  
Design and Synthesis of Organic  
Superconductors (FY92 URI/RIP).  
AD-A281 308

PERSONAL AUTHOR INDEX-9  
UNCLASSIFIED T4035K

MAM-MON

## UNCLASSIFIED

- \*MONTGOMERY, L. K. \* \* \*  
The Synthesis and Characterization  
of Radical Cation Salts of  
Bis(Ethylenedithio)Tetraselenafulval  
ene,  
AD-A281 118
- \* \* \*  
Synthesis, Superconductivity, X-ray  
Structure and Electronic Band  
Structure of Wavelengths-  
(BETS)2GaCl4,  
AD-A281 224
- \*MONTGOMERY, L. K. @@@@ \* \* \*  
Electric Field Dependence of  
Young's Modulus of (TMTSF)2PF6,  
AD-A281 324
- \*MOORE, JOHN W. @@@@ \* \* \*  
Biological and Theoretical Studies  
of Adaptive Networks: The  
Conditioned Response.  
AD-A284 781
- \*MOORE, ROBERT B. @@@@ \* \* \*  
Property Control of (Perfluorinated  
Ionomer)/(Inorganic Oxide)  
Composites by Tailoring the  
Nanoscale Morphology.  
AD-A281 370
- \*MUNTZ, E. P. \* \* \*  
Hypervelocity Air Flows With Finite  
Rate Chemistry.  
AD-A284 727
- \*NASH-STEVENSON, S. \* \* \*  
Near-Infrared to Blue Energy  
Upconversion in LaF(3):Ho3+.  
AD-A282 785
- \*NASH, PHILIP \* \* \*  
Processing and Characterization of  
Mechanically Alloyed NiAl-Based
- Alloys.  
AD-A283 959
- \*NICOLAIDES, ROY A. \* \* \*  
Computational Methods for  
Microstructure Covolume Techniques  
of Discretization.  
AD-A282 449
- \*NI, T. \* \* \*  
Spatially Resolved Measurements of  
Soot Volume Fraction Using Laser-  
Induced Incandescence.  
AD-A282 562
- \*NOSENCHUCK, DANIEL @@@ \* \* \*  
Study of a Navier-Stokes Computer.  
AD-A284 196
- \*NOWLIN, MELVIN L. @@@@ \* \* \*  
The Role of Excited Molecular  
Iodine in the Chemical Oxygen  
Iodine Laser,  
AD-A282 735
- \*NYGARD, KENDALL @@@ \* \* \*  
Microcomputer-Based Aircraft  
Routing and Scheduling. Phase 2.  
AD-A282 930
- \*OKUMURA, MITSUO @@@@ \* \* \*  
Fundamental Studies of a High  
Energy Molecular System:  
Spectroscopy of Boron in Hydrogen  
Clusters. ASSERT-92.  
AD-A283 181
- \*OLIPHANT, NEVIN \* \* \*  
Theoretical Determination of Charge-  
Transfer and Ligand Field  
Transition Energies for FeCl4 -  
Using the EDM-CCSD Method,  
AD-A284 198
- \*OSHER, STANLEY \* \* \*  
Reconstruction of Shapes from  
Shading and Shape Based Image  
Reconstruction Using Modern  
Nonlinear Analysis.  
AD-A284 107
- \*PANAHAHDEH, M. \* \* \*  
Structural Integrity of Intelligent  
Materials and Structures.  
Constitutive Modeling of Shape  
Memory Alloys.  
AD-A281 301
- \*PASTORE, RICHARD E. @@@@ \* \* \*  
Perception of Auditory Events:  
Attentional Limitations.  
AD-A284 399
- \*PAUL, DONALD R. @@@ \* \* \*  
Polymer-Polymer Interactions.  
AD-A282 944
- \*PERERA, S. A. \* \* \*  
Coupled-Cluster Calculations of  
Indirect Nuclear Coupling  
Constants: The Importance of Non-  
Fermi Contact Contributions,  
AD-A284 130
- \* \* \*  
Relativistic Effects at the  
Correlated Level. An Application to  
Interhalogens,  
AD-A284 145
- \* \* \*  
A Theoretical Study of Hyperfine  
Coupling Constants.  
AD-A284 440
- \*PEYGHAMBARIAN, N. \* \* \*  
New Mechanisms and New Materials  
for Organic Optical Nonlinearity.  
AD-A282 781
- \*PILGRIM, J. S.

PERSONAL AUTHOR INDEX-10  
UNCLASSIFIED  
T4035K

MON-PIL



# UNCLASSIFIED

\*\*\*  
Photodissociation Spectroscopy of  
Mg+ -Rare Gas Complexes,  
AD-A283 194

\*PLEMMONS, ROBERT J. @@@@  
\*\*\*  
Least Squares Computations in  
Science and Engineering.  
AD-A281 213

\*PODNEY, WALTER  
\*\*\*  
High Temperature SQUID Microprobe  
for Eddy Current Evaluation of  
Airframes.  
AD-B189 350L

\*QUAY, B  
\*\*\*  
Spatially Resolved Measurements of  
Soot Volume Fraction Using Laser-  
Induced Incandescence.  
AD-A282 562

\*RAFF, LIONEL M. @@@  
\*\*\*  
Classical Intramolecular Energy-  
Transfer Rates Using Fourier  
Transform Methods: Four-Atom  
Systems,  
AD-A284 113

\*RAFF, LIONEL M. @  
\*\*\*  
Diffusion of Hydrogen Atoms on a  
Si(111)-(7x7) Reconstructed  
Surface: Monte Carlo Variational  
Phase-Space Theory.  
AD-A284 205

\*RALPH, MARTIN R. @  
\*\*\*  
Cell Culture and Transplantation of  
the Suprachiasmatic Circadian  
Pacemaker.  
AD-A280 977

\*RASCHKE, SCOTT A  
\*\*\*  
Interface Mechanics of Particulate

Media with Ribbed Inclusions.  
AD-A283 957

\*RATNER, M. A. @  
\*\*\*  
Rational Design, Construction, and  
Processing of High-Performance  
Nonlinear, Optical Materials.  
AD-A281 283

\*REA, MICHAEL  
\*\*\*  
Transplantations and Cloning of an  
Immortal Cell Line from Rat SCN.  
AD-A280 978

\*REDDY, B. R  
\*\*\*  
Near-Infrared to Blue Energy  
Upconversion in LaF(3):Ho3+.  
AD-A282 785

\*REISLER, HANNA  
\*\*\*  
Gas-Surface Interactions Near  
Dissociation Threshold.  
AD-A282 726

\*REN, J  
\*\*\*  
Synthesis, Superconductivity, X-ray  
Structure and Electronic Band  
Structure of Wavelengths-  
(BETS)2GaCl4,  
AD-A281 224

\*REO, NICHOLAS V. @  
\*\*\*  
Hepatic Toxicity of  
Perfluorocarboxylic Acids.  
AD-A281 310

\*REPERT, STEVEN M  
\*\*\*  
Cellular Analysis of Circadian  
Rhythmicity in Cultured SCN  
neurons.  
AD-A284 167

\*RICHARDSON, MARTIN @  
\*\*\*

PERSONAL AUTHOR INDEX-11  
UNCLASSIFIED T4035K

Time-Resolved, High-Resolution, X-  
Ray Microscopy of In-Vitro  
Biological and Life Science  
Specimens with the Aid of Laser  
Plasmas.  
AD-A283 200

\*ROEDIGER, HENRY, III @@@  
\*\*\*  
Comparing Performance on Implicit  
Memory Tests.  
AD-A284 861

\*RUSAK, BENJAMIN @@@@  
\*\*\*  
Neurophysiological Analysis of  
Circadian Rhythm Entrainment.  
AD-A280 981

\*RUTLEDGE, J  
\*\*\*  
Advanced Cryogenic Propellants.  
AD-A282 451

\*SANCHEZ, ISSAC C  
\*\*\*  
Polymer-Polymer Interactions.  
AD-A282 944

\*SANTORO, ROBERT J  
\*\*\*  
Surface Reactivity of Combustion  
Generated Soot Particles.  
AD-A284 092

Combustion Instability Phenomena of  
Importance to Liquid Propellant  
Engines.  
AD-A284 780

\*SANTORO, R. J. @  
\*\*\*  
Spatially Resolved Measurements of  
Soot Volume Fraction Using Laser-  
Induced Incandescence.  
AD-A282 562

\*SASS, STEPHEN L. @  
\*\*\*  
Cornell Program for the Design and  
Synthesis of Advanced Materials.

PLE-SAS

# UNCLASSIFIED

AD-A281 352

\*SAYLER, G. S. @@@@

\* \* \*

Molecular Probes and Bioluminescent Reporters in Ecological Optimization of Biodegradation. (FY 91 AASERT).

AD-A284 170

\*SCHWERZEL, ROBERT E

\* \* \*

Enhanced Quantum Dot Nonlinear Optical Materials.

AD-B187 187

\*SEKINO, HIDEO

\* \* \*

Coupled-Cluster Calculations of Indirect Nuclear Coupling Constants: The Importance of Non-Fermi Contact Contributions,

AD-A284 130

\*SEWELL, THOMAS D

\* \* \*

A Full-Dimensional Semiclassical Calculation of Vibrational Mode Selectivity in the Tunneling Splitting in a Planar Model of Malonaldehyde,

AD-A284 772

\*SHEFFIELD, M

\* \* \*

Laser-Initiated Conical Detonation Wave for Supersonic Combustion. 2,

AD-A280 985

\*SHREEVE, JEANNE M

\* \* \*

Research on Organofluorine Chemistry for 700 Degrees F thermooxidative Stability.

AD-A282 767

\*SILBEY, ROBERT J. @

\* \* \*

Large Amplitude Motions, Especially Isomerization and Tunneling in Polyatomic Molecule Spectra: Novel

Experimental, Pattern Recognition, and Theoretical Methods.

AD-A284 194

\*SINGER, KENNETH D

\* \* \*

Thermal Relaxation Processes and Stability in Poled Electro-Optic Polymers.

AD-A283 948

\*SMITH, SHERYL S. @

\* \* \*

Cerebellar Circuit Mechanisms Which Accompany Coordinated Limb Trajectory Patterns in the Rat: Use of a Model of Spontaneous Changes in Limb Coordination.

AD-A284 023

\*SMOOKE, MITCHELL D. @

\* \* \*

Mechanistic Models of Soot Formation.

AD-A284 257

\*SORESCU, DAN C

\* \* \*

Diffusion of Hydrogen Atoms on a Si(111)-(7x7) Reconstructed Surface: Monte Carlo Variational Phase-Space Theory.

AD-A284 205

\*SPANGLER, CHARLES W. @@@

\* \* \*

Design Strategies for the Preparation of Polymeric Organic Superconductors.

AD-A281 306

\*SPERLING, GEORGE @@@@

\* \* \*

Visual Motion Perception and Visual Information Processing.

AD-A282 928

\*STEINBECK, JOHN

\* \* \*

'Superconductor Magnetic Memory'.

AD-B189 498L

\*STEINMAN, ROBERT @@@@

\* \* \*

Interdisciplinary Training in Life Sciences (FY91 Assert).

AD-A282 938

\*STEINMAN, ROBERT M. @@@@

\* \* \*

Coordinated Action in 3-D Space.

AD-A281 284

\*STEKLY, Z. J. @@@@

\* \* \*

Analysis of Constant Velocity Pulsed Plasma Accelerator,

AD-B188 916

\*STEP, EUGENE N

\* \* \*

Paramagnetic Interactions of Triplet Radical Pairs with Nitroxide Radicals: An 'Antiscavenging' Effect.

AD-A282 855

\*STONE, ERIC A

\* \* \*

Measurement and Regulation of Central Noradrenergic Receptors.

AD-A284 219

\*SUH, SUNG-JAE @@@@

\* \* \*

Processing and Characterization of Mechanically Alloyed NiAl-Based Alloys.

AD-A283 959

\*SULLIVAN, BRIAN J

\* \* \*

Structural Integrity of Intelligent Materials and Structures.

AD-A280 941

\*SWIRHUN, STAN

\* \* \*

Photonic Computer Links Using Multi-Channel Vertical-Cavity Surface-Emitting Laser Arrays.

AD-B186 566L

PERSONAL AUTHOR INDEX-12

UNCLASSIFIED T4035K

SAY-SWI

# UNCLASSIFIED

\*TABOREK, P.@@@  
 \*\*  
 Advanced Cryogenic Propellants.  
 AD-A282 451

\*TARASOV, VALERY F  
 \*\*\*  
 Exchange Interaction in Micellized  
 Radical Pairs.  
 AD-A283 195

\*TARR, MICHAEL J.@@  
 \*\*\*  
 Presentations of Shape in Object  
 Recognition and Long-Term Visual  
 Memory.  
 AD-A281 336

\*TELLINGHUISEN, JOEL@  
 \*\*\*  
 Spectroscopy of Metastable Species  
 in a Free-Jet Expansion: The D' to  
 A' (Reverse) Transition of IBr.  
 AD-A282 563

\*THAKUR, MRINAL  
 \*\*\*  
 Single Crystal Films and Waveguides  
 of Organic Materials: Preparation  
 and Nonlinear Optical Properties.  
 AD-A284 471

\*THOMPSON, DONALD L  
 \*\*\*  
 Classical Intramolecular Energy-  
 Transfer Rates Using Fourier  
 Transform Methods: Four-Atom  
 Systems.  
 AD-A284 113

\*\*\*  
 Diffusion of Hydrogen Atoms on a  
 Si(111)-(7x7) Reconstructed  
 Surface: Monte Carlo Variational  
 Phase-Space Theory.  
 AD-A284 205

\*THOMPSON, DONALD L.@@  
 \*\*\*  
 A Full-Dimensional Semiclassical  
 Calculation of Vibrational Mode  
 Selectivity in the Tunneling

Splitting in a Planar Model of  
 Malonaldehyde,  
 AD-A284 772

\*THURSBY, MICHAEL H.@@@  
 \*\*\*  
 Phase and Amplitude Controlled  
 Micropatch Antenna.  
 AD-A284 191

\*TOM, JEAN W  
 \*\*\*  
 Integral Equation Study of  
 Microstructure and Solvation in  
 Model Attractive and Repulsive  
 Supercritical Mixtures.  
 AD-A284 185

\*\*\*  
 Precipitation of Poly(L-Lactic  
 Acid) and Composite Poly(L-Lactic  
 Acid)-Pyrene Particles by Rapid  
 Expansion of Supercritical  
 Solutions,  
 AD-A284 199

\*TROSKO, JAMES E.@@  
 \*\*\*  
 The Role of Chemical Inhibition of  
 Gap Junctional Intercellular  
 Communication in Toxicology.  
 AD-A282 452

\*TURANO, KATHLEEN@@@  
 \*\*\*  
 Visual Psychophysics of Egomotion.  
 AD-A282 547

\*TURRO, NICHOLAS J  
 \*\*\*  
 ASSERT-92: A Novel Photochemical  
 and Interfacial Approach to the  
 Degradation of Hazardous Materials.  
 AD-A282 618

\*\*\*  
 Electron Transport Reactions  
 between Pyrene and Methylviologen  
 in a Model Biological Membrane.  
 AD-A283 184

\*TURRO, NICHOLAS J.@@@  
 \*\*\*  
 Graduate Student Training in

Paramagnetic Interactions of  
 Triplet Radical Pairs with Nitroxide  
 Radicals: An 'Antiscavenging'  
 Effect.  
 AD-A282 855

\*TURRO, NICHOLAS J.@@@  
 \*\*\*  
 Exchange Interaction in Micellized  
 Radical Pairs.  
 AD-A283 195

\*VAN CAUTER, EVE@@@  
 \*\*\*  
 Phase-Shifting Effects of Light and  
 Activity on the Human Circadian  
 Clock.  
 AD-A281 204

\*\*\*  
 Basic Mechanisms and Implications  
 of Non-Photoc Entrainment of  
 Circadian Rhythmicity.  
 AD-A283 180

\*VAN KUIJK, F. J  
 \*\*\*  
 Aldehydic Products of Lipid  
 Peroxidation in the Retina  
 Generated by Environmental Toxins.  
 AD-A284 172

\*VENKATESWARLU, P.@@@  
 \*\*\*  
 Near-Infrared to Blue Energy  
 Upconversion in LaF(3):Ho3+.  
 AD-A282 785

\*WANG, YIQIN  
 \*\*\*  
 AC Calorimetry at CDW and SDW  
 transitions,  
 AD-A281 117

\*\*\*  
 Thermodynamics of the Anion  
 Ordering Transitions in  
 (TMTSF)2ReO4 and (TMTSF)2BF4,  
 AD-A281 119

\*WARREN, WADE S  
 \*\*\*  
 Graduate Student Training in

PERSONAL AUTHOR INDEX-13  
 UNCLASSIFIED T4035K

TAB-WAR

## UNCLASSIFIED

Chronobiology. (FY91 Assert). The Suprachiasmatic Nucleus Controls the Circadian Rhythm of Heart Rate Via the Sympathetic Nervous System. AD-A284 132

\*WATSON, CHARLES S \* \* \*  
Perception of Complex Auditory Patterns. AD-A284 189

\*WATTS, JOHN D \* \* \*  
Accurate Electron Affinities of Small Carbon Clusters, AD-A284 434 \* \* \*  
A Theoretical Study of Hyperfine Coupling Constants. AD-A284 440

\*WELLAND, GRANT V \* \* \*  
Wavelets and Scattering. AD-A284 131

\*WELSH, DAVID K. \* \* \*  
Cellular Analysis of Circadian Rhythmicity in Cultured SCN neurons. AD-A284 167

\*WEN, CHIHYUNG \* \* \*  
Hypervelocity Flow simulation, AD-A284 197

\*WERT, J. A. \* \* \*  
Fundamental Concepts Relating Local Atomic Arrangements, Deformation, and Fracture of Intermetallic Alloys. AD-A282 971

\*WHANGBO, M. -H. \* \* \*  
Synthesis, Superconductivity, X-ray Structure and Electronic Band

Structure of Wavelengths- (BETS)2GaCl4, AD-A281 224

\*WHEELER, ROBERT L. \* \* \*  
Energy Decay and Control for Elastic and Viscoelastic Distributed Parameter Systems. AD-A281 312

\*WHITNEY, PAUL \* \* \*  
Augmentation of Research on Cognitive Control. AD-A280 956

\*WILLIAMS, F. A. \* \* \*  
Theories of Turbulent Combustion in High Speed Flows. AD-A280 933

\*WITTEN, MARK L. \* \* \*  
The Chronic Effects on JP-8 Jet Fuel Exposure on the Lungs. AD-A280 982

\* \* \*  
Research Training of the Effects of Toxic Substances on the Lungs. (FY91 AASERT). AD-A284 165

\*WITTIG, CURT \* \* \*  
Gas-Surface Interactions Near Dissociation Threshold. AD-A282 726

\*WOLFE, JEREMY M. \* \* \*  
Developing Guided Search 3.0. The Next Generation of a Model Visual Search. AD-A283 956

\*WONG, G. K \* \* \*  
Rational Design, Construction, and Processing of High-Performance

PERSONAL AUTHOR INDEX-14  
UNCLASSIFIED T4035K

Nonlinear, Optical Materials. AD-A281 283

\*WU, CHRISTINE J \* \* \*  
First-Principles-Derived Rate Constants for H Adatom Surface Diffusion on Si(100)-2x1, AD-A284 143

\*XU, Z. G \* \* \*  
Electric Field Dependence of Young's Modulus of (TMTSF)2PF6, AD-A281 324

\*YANG, T. T \* \* \*  
NCL(B) Based Short Wavelength Chemical Laser. AD-A284 213

\*YEH, C. S \* \* \*  
Photodissociation Spectroscopy of Mg+ -Rare Gas Complexes, AD-A283 194

\*YEH, POCHI \* \* \*  
Studies of Optical Phase Conjugators and Applications. AD-A282 626

\*ZHANG, JIMING \* \* \*  
'Superconductor Magnetic Memory'. AD-B189 498L

\*ZHANG, YI \* \* \*  
Measurement and Regulation of Central Noradrenergic Receptors. AD-A284 219

\*ZHENG, XIAONAN \* \* \*  
Spectroscopy of Metastable Species in a Free-Jet Expansion: The D' to A' (Reverse) Transition of IBr. AD-A282 563

WAT-ZHE

## **TITLE INDEX**

## UNCLASSIFIED

## TITLE INDEX

AASERT-92 Observational Analysis of the Origin of Non-Double Couple Seismic Sources.  
 AD-A281 158

AASERT 92 - Synthesis and Properties of Complex Polyarylene Vinylenes.  
 AD-A284 215

AASERT-93: Electroplating of Refractory Metals Using Haloaluminate Melts.  
 AD-A284 859

Accurate Electron Affinities of Small Carbon Clusters,  
 AD-A284 434

AC Calorimetry at CDW and SDW transitions,  
 AD-A281 117

Advanced Cryogenic Propellants.  
 AD-A282 451

Air Force Engineering Research Initiation Grant Program.  
 AD-A284 028

Air Force Office of Scientific Research. Research Proposal, Quarterly Status Report October-December 1993.  
 AD-A282 939

Aldehydic Products of Lipid Peroxidation in the Retina Generated by Environmental Toxins.  
 AD-A284 172

Analysis of Constant Velocity Pulsed Plasma Accelerator,  
 AD-B188 916

ASSERT-92: A Novel Photochemical and Interfacial Approach to the Degradation of Hazardous Materials.  
 AD-A282 618

Atomic Processes Relevant to Antimatter Fuel Production and Storage.  
 AD-A280 938

Augmentation of Research on Cognitive Control.  
 AD-A280 956

Basic Mechanisms and Implications of Non-Photoc Entrainment of Circadian Rhythmicity.  
 AD-A283 180

Biological and Theoretical Studies of Adaptive Networks: The Conditioned Response.  
 AD-A284 781

Biotransformation of Toxic Metals by Bacteria.  
 AD-A280 893

Boron Atom Matrix Chemistry.  
 AD-A282 840

Cellular Analysis of Circadian Rhythmicity in Cultured SCN neurons.  
 AD-A284 167

Cellular Neurophysiology of the Rat Suprachiasmatic Nucleus: Electrical Properties, Neurotransmission, and Mechanisms of Synchronization.  
 AD-A284 111

Cell Culture and Transplantation of the Suprachiasmatic Circadian Pacemaker.  
 AD-A280 977

Cerebellar Circuit Mechanisms Which Accompany Coordinated Limb Trajectory Patterns in the Rat: Use of a Model of Spontaneous Changes in Limb Coordination.  
 AD-A284 023

Characterization of Heterogeneities Controlling Transport and Fate of Pollutants in Unconsolidated Sand

and Gravel Aquifers: Third Year Report.  
 AD-A284 193

Chemisorption Energetics of Superactive Chlorine Containing Species on Gallium Arsenide Surfaces.  
 AD-A281 311

The Chronic Effects on JP-8 Jet Fuel Exposure on the Lungs.  
 AD-A280 982

Classical Intramolecular Energy-Transfer Rates Using Fourier Transform Methods: Four-Atom Systems.  
 AD-A284 113

Cluster Ions.  
 AD-A282 615

Cognitive/Self-Regulatory Aptitudes and Instructional Methods for Complex Skill Learning.  
 AD-A280 937

Combustion Instability Phenomena of Importance to Liquid Propellant Engines.  
 AD-A284 780

Comparing Performance on Implicit Memory Tests.  
 AD-A284 861

Computational Methods for Microstructure Covolume Techniques of Discretization.  
 AD-A282 449

Computational Methods for PDEs in Flow Control, Superconductivity, Fluid Flows and Other Applications.  
 AD-A282 912

Computational Vision Based on Neurobiology.  
 AD-A284 472

TITLE INDEX-1

UNCLASSIFIED T4035K

UNCLASSIFIED

Conjugated Polymers with Degenerate Ground State: The Route to High Performance NLO Response. (FY1 ASSERT).  
AD-A283 958

Cooperativity and 3-D representation.  
AD-A284 203

Coordinated Action in 3-D Space.  
AD-A281 284

Cornell Program for the Design and Synthesis of Advanced Materials.  
AD-A281 352

Coupled-Cluster Calculations of Indirect Nuclear Coupling Constants: The Importance of Non-Fermi Contact Contributions.  
AD-A284 130

Cumulative Effects of Repeated Brief Cerebral Ischemia.  
AD-A284 234

Design and Synthesis of Organic Superconductors (FY92 URI/RIP).  
AD-A281 308

Design Strategies for the Preparation of Polymeric Organic Superconductors.  
AD-A281 306

Developing Guided Search 3.0. The Next Generation of a Model Visual Search.  
AD-A283 956

Development of Oxygen Scavenger Additives for Jet Fuels.  
AD-A281 307

Development of Techniques for the Evaluation of Toxicant Impacts to Multispecies Systems.  
AD-A284 426

Diffusion of Hydrogen Atoms on a

Si(111)-(7x7) Reconstructed Surface: Monte Carlo Variational Phase-Space Theory.  
AD-A284 205

Electric Field Dependence of Young's Modulus of (TMTSF)2PF6.  
AD-A281 324

Electrochemical and Spectroscopy Studies of Selected Inorganic and Organic Systems in Molten Halides.  
AD-A284 171

Electron Transport Reactions between Pyrene and Methylviologen in a Model Biological Membrane.  
AD-A283 184

Elemental Fluorine Based Syntheses of Pentafluoro Phenyl and other Aromatic Perfluoropolyether Polymers.  
AD-A284 102

Energy Decay and Control for Elastic and Viscoelastic Distributed Parameter Systems.  
AD-A281 312

Enhanced Quantum Dot Nonlinear Optical Materials.  
AD-B187 187

Exchange Interaction in Micellized Radical Pairs.  
AD-A283 195

Extrathalamic Modulation of Cortical Responsiveness.  
AD-A284 100

Fabrication of Biomimetic Molecular Level Composites.  
AD-A284 204

Finite Markov Chains and Random Discrete Structures.  
AD-A284 192

First-Principles-Derived Rate

Constants for H Adatom Surface Diffusion on Si(100)-2x1.  
AD-A284 143

A Full-Dimensional Semiclassical Calculation of Vibrational Mode Selectivity in the Tunneling Splitting in a Planar Model of Malonaldehyde.  
AD-A284 772

Fundamentals of Astrodynamics.  
AD-B189 080

Fundamental Concepts Relating Local Atomic Arrangements, Deformation, and Fracture of Intermetallic Alloys.  
AD-A282 971

Fundamental Studies of a High Energy Molecular System: Spectroscopy of Boron in Hydrogen Clusters. ASSERT-92.  
AD-A283 181

Gas-Surface Interactions Near Dissociation Threshold.  
AD-A282 726

Geochemical, Genetic and Physiological Control of Pollutant Biodegradation.  
AD-A280 931

Geometrical and Topological Methods in Time Domain Antenna Synthesis.  
AD-A284 208

Graduate Student Training in Chronobiology. (FY91 Assert). The Suprachiasmatic Nucleus Controls the Circadian Rhythm of Heart Rate Via the Sympathetic Nervous System.  
AD-A284 132

Hepatic Toxicity of Perfluorocarboxylic Acids.  
AD-A281 310

High Temperature Fracture

TITLE INDEX-2  
UNCLASSIFIED T4035K

CON-HIG



# UNCLASSIFIED

Mechanisms in Metallic Matrix Composites Produced by Solidification Techniques.  
AD-A284 169

High Temperature SQUID Microprobe for Eddy Current Evaluation of Airframes.  
AD-B189 350L

High Temperature Stability of Binary Microstructures Derived from Liquid Precursors.  
AD-A283 960

High Temperature Superconductors with Improved Current Densities.  
AD-A282 996

Hydrolysis and Condensation of Tin (IV) Alkoxide Compounds: The Control of Structural Evolution.  
AD-A282 789

Hypervelocity Air Flows With Finite Rate Chemistry.  
AD-A284 727

Hypervelocity Flow simulation.  
AD-A284 197

Integral Equation Study of Microstructure and Solvation in Model Attractive and Repulsive Supercritical Mixtures.  
AD-A284 185

Interaction of Chemistry, Turbulence, and Shock Waves in Hypervelocity Flow.  
AD-A282 941

Interdisciplinary Training in Life Sciences (FY91 Assert).  
AD-A282 938

Interface Mechanics of Particulate Media with Ribbed Inclusions.  
AD-A283 957

International Collaboration Program

in Innovative Chemical Processing of Superior Electronic and Optical Materials.  
AD-A282 946

In Situ Laser Activation of Electrochemical Kinetics at Carbon Electrodes.  
AD-A280 892

In Vitro System for Studying Metabolism of Environmental Chemicals in Human Cells.  
AD-A284 174

Large Amplitude Motions, Especially Isomerization and Tunneling in Polyatomic Molecule Spectra: Novel Experimental, Pattern Recognition, and Theoretical Methods.  
AD-A284 194

Large Signal Time Dependent Quantum Mechanical Transport in Quantum Phase Based Devices.  
AD-A283 338

Laser-Initiated Conical Detonation Wave for Supersonic Combustion. 2.  
AD-A280 985

Laser Spectroscopy of Gdo: Ligand Field Assignments of 4f7(8S)6p Reversing 4f7(8)6s Transitions.  
AD-A282 827

Laser Spectroscopy of UO: Characterization and Assignment of States in the 0- to 3-eV Range, with a Comparison to the Electronic Structure of ThO.  
AD-A282 546

Least Squares Computations in Science and Engineering.  
AD-A281 213

Light Beam and Pulse Propagation in Nonlinear Dielectrics.  
AD-A282 548

Local Spatio-Temporal Analysis in Vision Systems.  
AD-A284 162

Locus Coeruleus, Vigilance and Stress: Brain Mechanisms of Adaptive Behavioral Responsiveness.  
AD-A282 450

Low Temperature Grown and Highly Non-Stoichiometric GaAs and Related Materials.  
AD-A284 898

Magneto-Optical Properties of Quantum Structures with Reduced Dimensionality.  
AD-A282 597

Materials Degradation and Fatigue Under Extreme Conditions.  
AD-A282 969

Materials for Second and Third Order Nonlinear Optical Applications.  
AD-A281 304

Mathematical Analysis of Three Free-Electron-Laser Issues.  
AD-A284 122

Mathematical Problems of Nonlinear Wave Propagation and of Waves in Heterogeneous Media.  
AD-A282 217

Measurements and Simulations of Particle Dispersion in a Turbulent Flow.  
AD-A280 973

Measurements of Droplet Dispersion in Heated and Unheated Turbulent Jets.  
AD-A284 252

Measurement and Regulation of Central Noradrenergic Receptors.  
AD-A284 219

TITLE INDEX-3  
UNCLASSIFIED T4035K

HIG-MEA



# UNCLASSIFIED

Mechanistic Models of Soot Formation.  
AD-A284 257

Microcomputer-Based Aircraft Routing and Scheduling. Phase 2.  
AD-A282 930

Molecular Probes and Bioluminescent Reporters in Ecological Optimization of Biodegradation. (FY 91 AASERT).  
AD-A284 170

Multi-Functional pi-Conjugated Macromolecules Based on Poly(Phenylene Vinylene).  
AD-A284 163

NCL(B) Based Short Wavelength Chemical Laser.  
AD-A284 213

Near-Infrared to Blue Energy Upconversion in LaF(3):Ho3+.  
AD-A282 785

Neurophysiological Analysis of Circadian Rhythm Entrainment.  
AD-A280 981

New Mechanisms and New Materials for Organic Optical Nonlinearity.  
AD-A282 781

A New Multi-Dimensional Transform for Digital Signal Processing Using Generalized Association Schemes.  
AD-A284 166

Nonlinear Optical and Charge Distribution Studies Probing Electric Field Effects in Polymer Thin Films for Second Order Nonlinear Optics.  
AD-A280 980

Novel Polymeric Composites Through Molecular Engineering.  
AD-A284 168

Numerical Studies of Low Temperature Gallium Arsenide Buffer Layers and Their Influence on Device Operation.  
AD-A281 156

A Parallel Processing Hypothesis for Short-Term and Long-Term Memory in Aplysia.  
AD-A284 101

Paramagnetic Interactions of Triplet Radical Pairs with Nitroxide Radicals: An 'Antiscavenging' Effect.  
AD-A282 855

Perception of Auditory Events: Attentional Limitations.  
AD-A284 399

Perception of Complex Auditory Patterns.  
AD-A284 189

Phase and Amplitude Controlled Micropatch Antenna.  
AD-A284 191

Phase-Shifting Effects of Light and Activity on the Human Circadian Clock.  
AD-A281 204

Photodissociation Spectroscopy of Mg+ -Rare Gas Complexes.  
AD-A283 194

Photogeneration and Characterization of Energetic Molecules in Supersonic Molecular Beams.  
AD-A284 108

Photonic Computer Links Using Multi-Channel Vertical-Cavity Surface-Emitting Laser Arrays.  
AD-B186 566L

Polyhedral Approaches for Solving 0-1 Polynomial Programming Problems.

AD-A282 448

Polymer Fibers for Nonlinear Optics.  
AD-A284 216

Polymer-Polymer Interactions.  
AD-A282 944

Precipitation of Poly(L-Lactic Acid) and Composite Poly(L-Lactic Acid)-Pyrene Particles by Rapid Expansion of Supercritical Solutions.  
AD-A284 199

Presentations of Shape in Object Recognition and Long-Term Visual Memory.  
AD-A281 336

Processes Involved in the Integration of Pictures and Discourse.  
AD-A282 942

Processing and Characterization of Mechanically Alloyed NiAl-Based Alloys.  
AD-A283 959

Property Control of (Perfluorinated Ionomer)/(Inorganic Oxide) Composites by Tailoring the Nanoscale Morphology.  
AD-A281 370

Quantum Well and Superlattice IR detector Development. Phase 1.  
AD-B187 142

Rational Design, Construction, and Processing of High-Performance Nonlinear, Optical Materials.  
AD-A281 283

Reactions of Atmospheric Cluster Ions.  
AD-A282 598

Reconstruction of Shapes from

TITLE INDEX-4  
UNCLASSIFIED T4035K

MEC-REC

# UNCLASSIFIED

Shading and Shape Based Image Reconstruction Using Modern Nonlinear Analysis.  
AD-A284 107

Relativistic Effects at the Correlated Level. An Application to Interhalogens,  
AD-A284 145

Research on Organofluorine Chemistry for 700 Degrees F thermooxidative Stability.  
AD-A282 767

Research Training For Understanding the Fate of Environmental Pollutants. (FY91 AASERT).  
AD-A284 164

Research Training of the Effects of Toxic Substances on the Lungs. (FY91 AASERT).  
AD-A284 165

Resonant Charge Transfer in Hyperthermal Atomic and Molecular Ion-Surface Collisions.  
AD-A281 369

The Role of Chemical Inhibition of Gap Junctional Intercellular Communication in Toxicology.  
AD-A282 452

The Role of Excited Molecular Iodine in the Chemical Oxygen Iodine Laser.  
AD-A282 735

SAM1 Semiempirical Parameters.  
AD-A284 400

Shaped Strain Sensors for Intelligent Structures.  
AD-A282 333

Signet-Software Tools for Signal Identification Using Neural Networks.  
AD-A284 362

A Simulation of Particle Dispersion in a Turbulent Jet,  
AD-A280 930

Single Crystal Films and Waveguides of Organic Materials: Preparation and Nonlinear Optical Properties.  
AD-A284 471

Situational Awareness in Complex Systems.  
AD-A281 448

Solute-Solute Interactions: Theory and Simulations,  
AD-A284 226

Spatially Resolved Measurements of Soot Volume Fraction Using Laser-Induced Incandescence.  
AD-A282 562

Spectroelectrochemical Investigations of Molten Halide Solutions.  
AD-A284 147

Spectroscopy of Metastable Species in a Free-Jet Expansion: The D' to A' (Reverse) Transition of IBr.  
AD-A282 563

Stochastic Control and Nonlinear Estimation.  
AD-A281 219

Structural Integrity of Intelligent Materials and Structures. Constitutive Modeling of Shape Memory Alloys.  
AD-A281 301

Structural Integrity of Intelligent Materials and Structures.  
AD-A280 941

Structure-Activity Relationships of Chlorinated Alicyclic Compounds in Catfish.  
AD-A280 927

Studies of Optical Phase Conjugators and Applications.  
AD-A282 626

Studies on High Pressure and Unsteady Flame Phenomena.  
AD-A284 126

Study of a Navier-Stokes Computer.  
AD-A284 196

'Superconductor Magnetic Memory'.  
AD-B189 498L

Supercritical Fluids in Particle Formation Media,  
AD-A284 217

Surface Reactivity of Combustion Generated Soot Particles.  
AD-A284 092

The Synthesis and Characterization of Radical Cation Salts of Bis(Ethyleneedithio)Tetraselenafulvalene.  
AD-A281 118

Synthesis, Superconductivity, X-ray Structure and Electronic Band Structure of Wavelengths-(BETS)2GaCl4,  
AD-A281 224

Systematic Optimization of Second Order Nonlinear Optical Materials.  
AD-A281 350

A Technique for Measuring Lagrangian and Eulerian Particle Statistics in a Turbulent Flow,  
AD-A280 932

Theoretical and Experimental Studies of Laser-Initiated Detonation Waves for Supersonic Combustion,  
AD-A280 984

Theoretical Determination of Charge-Transfer and Ligand Field

TITLE INDEX-5  
UNCLASSIFIED T4035K

REL-THE

UNCLASSIFIED

Transition Energies for FeCl<sub>4</sub> -  
Using the EOM-CCSD Method,  
AD-A284 198

Theoretical Modeling of Ocular  
Tissue Damage by Short Pulse Laser.  
AD-A280 928

A Theoretical Study of Hypertine  
Coupling Constants.  
AD-A284 440

Theories of Turbulent Combustion in  
High Speed Flows.  
AD-A280 933

Thermal Relaxation Processes and  
Stability in Poled Electro-Optic  
Polymers.  
AD-A283 948

Thermodynamics of the Anion  
Ordering Transitions in  
(TMTSF)<sub>2</sub>ReO<sub>4</sub> and (TMTSF)<sub>2</sub>BF<sub>4</sub>,  
AD-A281 119

Time-Resolved, High-Resolution, X-  
Ray Microscopy of In-Vitro  
Biological and Life Science  
Specimens with the Aid of Laser  
Plasmas.  
AD-A283 200

Transonic Flow Separation in Closed  
Curved Channels.  
AD-A280 728

Transplantations and Cloning of an  
Immortal Cell Line from Rat SCN.  
AD-A280 978

Ultrashort Laser Pulse Effects in  
Ocular and Related Media: Laser-  
Induced Shock Wave Propagation and  
Retinal Damage.  
AD-A282 599

Vibrational Specificity for Charge  
Transfer Versus Deactivation in  
N<sub>2</sub>(v = 0, 1, 2) + Ar and O<sub>2</sub>  
Reactions,

AD-A284 200

Visual Motion Perception and Visual  
Information Processing.  
AD-A282 928

Visual Psychophysics of Egomotion.  
AD-A282 547

Visuo-Ocular Performance During  
Vestibular Stimulation.  
AD-A284 103

Wavelength-Encoded Processing in  
Semiconductor Lasers.  
AD-A282 649

Wavelets and Scattering.  
AD-A284 131

TITLE INDEX-6  
UNCLASSIFIED T4035K

THE-WAV

## UNCLASSIFIED

## TITLE INDEX

AASERT 92 - Synthesis and Properties of Complex Polyarylene Vinylenes.  
AD-A284215 REPORT DATE: 31 MAY 94 ANNUAL REPORT

AASERT-92 Observational Analysis of the Origin of Non-Double Couple Seismic Sources.  
AD-A281158 REPORT DATE: 31 MAY 94 ANNUAL REPORT

AASERT-93: Electroplating of Refractory Metals Using Haloaluminate Melts.  
AD-A284859 REPORT DATE: 31 AUG 94 ANNUAL REPORT

AC Calorimetry at CDW and SDW Transitions,  
AD-A281117 REPORT DATE: 93 FINAL REPORT

Accurate Electron Affinities of Small Carbon Clusters,  
AD-A284434 REPORT DATE: 01 JUL 94 ANNUAL REPORT

Advanced Cryogenic Propellants.  
AD-A282451 REPORT DATE: 14 APR 94 ANNUAL REPORT

Air Force Engineering Research Initiation Grant Program.  
AD-A284028 REPORT DATE: 21 JUN 94 FINAL REPORT

Air Force Office of Scientific Research. Research Proposal, Quarterly Status Report October-December 1993.  
AD-A282939 REPORT DATE: OCT 93 ANNUAL REPORT

Aldehydic Products of Lipid Peroxidation in the Retina Generated by Environmental Toxins.  
AD-A284172 REPORT DATE: 31 DEC 94 ANNUAL REPORT

Analysis of Constant Velocity Pulsed Plasma Accelerator,  
AD-B188916 REPORT DATE: JUL 60

ASSERT-92: A Novel Photochemical and Interfacial Approach to the Degradation of Hazardous Materials.  
AD-A282618 REPORT DATE: 14 JUN 94 ANNUAL REPORT

Atomic Processes Relevant to Antimatter Fuel Production and Storage.  
AD-A280938 REPORT DATE: 31 MAY 94 FINAL REPORT

Augmentation of Research on Cognitive Control.  
AD-A280956 REPORT DATE: 07 JUN 94 ANNUAL REPORT

Basic Mechanisms and Implications of Non-Photic Entrainment of Circadian Rhythmicity.  
AD-A283180 REPORT DATE: 30 AUG 93 ANNUAL REPORT

Biological and Theoretical Studies of Adaptive Networks: The Conditioned Response.  
AD-A284781 REPORT DATE: 30 AUG 94 FINAL REPORT

Bioretransformation of Toxic Metals by Bacteria.  
AD-A280893 REPORT DATE: 31 MAY 94 ANNUAL REPORT

Boron Atom Matrix Chemistry.  
AD-A282840 REPORT DATE: 31 MAY 94 ANNUAL REPORT

TITLE INDEX 1

AAS - BOR

UNCLASSIFIED T4035K

UNCLASSIFIED

TITLE INDEX

Cell Culture and Transplantation of the Suprachiasmatic Circadian Pacemaker.  
AD-A280977 REPORT DATE: 29 SEP 93 ANNUAL REPORT

Cellular Analysis of Circadian Rhythmicity in Cultured SCN Neurons.  
AD-A284167 REPORT DATE: 28 JUL 94 ANNUAL REPORT

Cellular Neurophysiology of the Rat Suprachiasmatic Nucleus: Electrical Properties, Neurotransmission, and Mechanisms of Synchronization.  
AD-A284111 REPORT DATE: 29 JUL 94 ANNUAL REPORT

Cerebellar Circuit Mechanisms Which Accompany Coordinated Limb Trajectory Patterns in the Rat: Use of a Model of Spontaneous Changes in Limb Coordination.  
AD-A284023 REPORT DATE: 01 AUG 94 ANNUAL REPORT

Characterization of Heterogeneities Controlling Transport and Fate of Pollutants in Unconsolidated Sand and Gravel Aquifers: Third Year Report.  
AD-A284193 REPORT DATE: 30 JUN 94 ANNUAL REPORT

Chemisorption Energetics of Superactive Chlorine Containing Species on Gallium Arsenide Surfaces.  
AD-A281311 REPORT DATE: DEC 93 FINAL REPORT

The Chronic Effects on JP-8 Jet Fuel Exposure on the Lungs.  
AD-A280982 REPORT DATE: 02 JUN 94 FINAL REPORT

Classical Intramolecular Energy-Transfer Rates Using Fourier Transform Methods: Four-Atom Systems.  
AD-A284113 REPORT DATE: 94 FINAL REPORT

Cluster Ions.  
AD-A282615 REPORT DATE: 30 JUN 94 ANNUAL REPORT

Cognitive/Self-Regulatory Aptitudes and Instructional Methods for Complex Skill Learning.  
AD-A280937 REPORT DATE: 26 MAY 94 ANNUAL REPORT

Combustion Instability Phenomena of Importance to Liquid Propellant Engines.  
AD-A284780 REPORT DATE: 31 AUG 94 FINAL REPORT

Comparing Performance on Implicit Memory Tests.  
AD-A284861 REPORT DATE: 31 AUG 94 ANNUAL REPORT

Computational Methods for Microstructure Covolume Techniques of Discretization.  
AD-A282449 REPORT DATE: 31 MAY 94 FINAL REPORT

Computational Methods for PDEs in Flow Control, Superconductivity, Fluid Flows and Other Applications.  
AD-A282912 REPORT DATE: 31 APR 94 FINAL REPORT

Computational Vision Based on Neurobiology.  
AD-A284472 REPORT DATE: 10 AUG 94 FINAL REPORT

Conjugated Polymers with Degenerate Ground State: The Route to High Performance NLO Response. (F91 ASSERT).  
AD-A283958 REPORT DATE: 31 MAY 94 ANNUAL REPORT

TITLE INDEX

2

CEL - CON

UNCLASSIFIED

T4035K

## UNCLASSIFIED

## TITLE INDEX

Cooperativity and 3-D Representation.  
AD-A284203 REPORT DATE: 26 JUL 94 FINAL REPORT

Coordinated Action in 3-D Space.  
AD-A281284 REPORT DATE: 31 MAY 94 FINAL REPORT

Cornell Program for the Design and Synthesis of Advanced Materials.  
AD-A281352 REPORT DATE: MAY 94 ANNUAL REPORT

Coupled-Cluster Calculations of Indirect Nuclear Coupling Constants: The Importance of Non-Fermi Contact Contributions.  
AD-A284130 REPORT DATE: 01 AUG 94 FINAL REPORT

Cumulative Effects of Repeated Brief Cerebral Ischemia.  
AD-A284234 REPORT DATE: 94 FINAL REPORT

Design and Synthesis of Organic Superconductors (FY92 URI/RIP).  
AD-A281308 REPORT DATE: 29 OCT 93 ANNUAL REPORT

Design Strategies for the Preparation of Polymeric Organic Superconductors.  
AD-A281306 REPORT DATE: 30 SEP 92 ANNUAL REPORT

Developing Guided Search 3.0. The Next Generation of a Model Visual Search.  
AD-A283956 REPORT DATE: 01 JUL 94 ANNUAL REPORT

Development of Oxygen Scavenger Additives for Jet Fuels.  
AD-A281307 REPORT DATE: 01 MAY 93 ANNUAL REPORT

Development of Techniques for the Evaluation of Toxicant Impacts to Multispecies Systems.  
AD-A284426 REPORT DATE: 31 MAY 94 FINAL REPORT

Diffusion of Hydrogen Atoms on a Si(111)-(7x7) Reconstructed Surface: Monte Carlo Variational Phase-Space Theory.  
AD-A284205 REPORT DATE: 15 JUL 94 FINAL REPORT

Electric Field Dependence of Young's Modulus of (TMTSF)<sub>2</sub>PF<sub>6</sub>.  
AD-A281324 REPORT DATE: 93 ANNUAL REPORT

Electrochemical and Spectroscopy Studies of Selected Inorganic and Organic Systems in Molten Halides.  
AD-A284171 REPORT DATE: 14 FEB 94 ANNUAL REPORT

Electron Transport Reactions between Pyrene and Methylviologen in a Model Biological Membrane.  
AD-A283184 REPORT DATE: 94 FINAL REPORT

Elemental Fluorine Based Syntheses of Pentafluoro Phenyl and other Aromatic Perfluoropolyether Polymers.  
AD-A284102 REPORT DATE: 31 JAN 94 ANNUAL REPORT

Energy Decay and Control for Elastic and Viscoelastic Distributed Parameter Systems.  
AD-A281312 REPORT DATE: 08 JUN 94 FINAL REPORT

Enhanced Quantum Dot Nonlinear Optical Materials.  
AD-B187187 REPORT DATE: 01 JUL 94 FINAL REPORT

TITLE INDEX 3

C00 - ENH

UNCLASSIFIED T4035K

## UNCLASSIFIED

## TITLE INDEX

Exchange Interaction in Micellized Radical Pairs.  
AD-A283195 REPORT DATE: 93 FINAL REPORT

Extrathalamic Modulation of Cortical Responsiveness.  
AD-A284100 REPORT DATE: 01 AUG 94 ANNUAL REPORT

Fabrication of Biomimetic Molecular Level Composites.  
AD-A284204 REPORT DATE: 31 MAY 94 ANNUAL REPORT

Finite Markov Chains and Random Discrete Structures.  
AD-A284192 REPORT DATE: 26 JUL 94 FINAL REPORT

First-Principles-Derived Rate Constants for H Adatom Surface Diffusion on Si(100)-2x1,  
AD-A284143 REPORT DATE: 15 MAY 94 ANNUAL REPORT

A Full-Dimensional Semiclassical Calculation of Vibrational Mode Selectivity in the Tunneling Splitting in a Planar Model  
of Malonaldehyde.  
AD-A284772 REPORT DATE: 06 SEP 94 FINAL REPORT

Fundamental Concepts Relating Local Atomic Arrangements, Deformation, and Fracture of Intermetallic Alloys.  
AD-A282971 REPORT DATE: APR 94 FINAL REPORT

Fundamental Studies of a High Energy Molecular System: Spectroscopy of Boron in Hydrogen Clusters. ASSERT-92.  
AD-A283181 REPORT DATE: 24 JUN 94

Fundamentals of Astrodynamics.  
AD-B189080 REPORT DATE: 30 SEP 59

Gas-Surface Interactions Near Dissociation Threshold.  
AD-A282726 REPORT DATE: 30 JUN 94 ANNUAL REPORT

Geochemical, Genetic and Physiological Control of Pollutant Biodegradation.  
AD-A280931 REPORT DATE: 29 APR 94 ANNUAL REPORT

Geometrical and Topological Methods in Time Domain Antenna Synthesis.  
AD-A284208 REPORT DATE: 30 APR 94 FINAL REPORT

Graduate Student Training in Chronobiology. (FY91 Assert). The Suprachiasmatic Nucleus Controls the Circadian Rhythm of  
Heart Rate Via the Sympathetic Nervous System.  
AD-A284132 REPORT DATE: 94 ANNUAL REPORT

Hepatic Toxicity of Perfluorocarboxylic Acids.  
AD-A281310 REPORT DATE: 06 JUN 94 ANNUAL REPORT

High Temperature Fracture Mechanisms in Metallic Matrix Composites Produced by Solidification Techniques.  
AD-A284169 REPORT DATE: 92 FINAL REPORT

High Temperature SQUID Microprobe for Eddy Current Evaluation of Airframes.  
AD-B189350L REPORT DATE: AUG 94 FINAL REPORT

TITLE INDEX 4

UNCLASSIFIED T4035K

EXC - HIG



## UNCLASSIFIED

## TITLE INDEX

High Temperature Stability of Binary Microstructures Derived from Liquid Precursors.  
AD-A283960 REPORT DATE: 30 JUN 94 FINAL REPORT

High Temperature Superconductors with Improved Current Densities.  
AD-A282996 REPORT DATE: 15 JUN 94 FINAL REPORT

Hydrolysis and Condensation of Tin (IV) Alkoxide Compounds: The Control of Structural Evolution.  
AD-A282789 REPORT DATE: 03 JUN 94 ANNUAL REPORT

Hypervelocity Air Flows With Finite Rate Chemistry.  
AD-A284727 REPORT DATE: 01 JUL 94 ANNUAL REPORT

Hypervelocity Flow simulation,  
AD-A284197 REPORT DATE: JUN 94 FINAL REPORT

In Situ Laser Activation of Electrochemical Kinetics at Carbon Electrodes.  
AD-A280892 REPORT DATE: 31 MAY 94 FINAL REPORT

In Vitro System for Studying Metabolism of Environmental Chemicals in Human Cells.  
AD-A284174 REPORT DATE: 25 JUL 94 ANNUAL REPORT

Integral Equation Study of Microstructure and Solvation in Model Attractive and Repulsive Supercritical Mixtures.  
AD-A284185 REPORT DATE: 93 ANNUAL REPORT

Interaction of Chemistry, Turbulence, and Shock Waves in Hypervelocity Flow.  
AD-A282941 REPORT DATE: MAY 94 ANNUAL REPORT

Interdisciplinary Training in Life Sciences (FY91 Assert).  
AD-A282938 REPORT DATE: 15 JUN 94 ANNUAL REPORT

Interface Mechanics of Particulate Media with Ribbed Inclusions.  
AD-A283957 REPORT DATE: 15 JUN 94 FINAL REPORT

International Collaboration Program in Innovative Chemical Processing of Superior Electronic and Optical Materials.  
AD-A282946 REPORT DATE: JUN 93 ANNUAL REPORT

Large Amplitude Motions, Especially Isomerization and Tunneling in Polyatomic Molecule Spectra: Novel Experimental, Pattern Recognition, and Theoretical Methods.  
AD-A284194 REPORT DATE: 29 JUL 94 FINAL REPORT

Large Signal Time Dependent Quantum Mechanical Transport in Quantum Phase Based Devices.  
AD-A283338 REPORT DATE: 10 JUN 94 FINAL REPORT

Laser Spectroscopy of Gd<sup>3+</sup>: Ligand Field Assignments of 4f<sup>7</sup>(8s)6p Reversing 4f<sup>7</sup>(8s)6s Transitions,  
AD-A282827 REPORT DATE: 94 ANNUAL REPORT

Laser Spectroscopy of UO<sub>2</sub>: Characterization and Assignment of States in the 0- to 3-eV Range, with a Comparison to the Electronic Structure of ThO<sub>2</sub>.  
AD-A282546 REPORT DATE: 94 FINAL REPORT

TITLE INDEX

5

HIG - LAS

UNCLASSIFIED

T4035K



## UNCLASSIFIED

## TITLE INDEX

Laser-Initiated Conical Detonation Wave for Supersonic Combustion. 2.  
AD-A280985 REPORT DATE: APR 93 FINAL REPORT

Least Squares Computations in Science and Engineering.  
AD-A281213 REPORT DATE: FEB 94 FINAL REPORT

Light Beam and Pulse Propagation in Nonlinear Dielectrics.  
AD-A282548 REPORT DATE: 30 SEP 93 FINAL REPORT

Local Spatio-Temporal Analysis in Vision Systems.  
AD-A284162 REPORT DATE: 31 JUL 94 ANNUAL REPORT

Locus Coeruleus, Vigilance and Stress: Brain Mechanisms of Adaptive Behavioral Responsiveness.  
AD-A282450 REPORT DATE: 08 JUL 94 ANNUAL REPORT

Low Temperature Grown and Highly Non-Stoichiometric GaAs and Related Materials.  
AD-A284898 REPORT DATE: 03 AUG 94 FINAL REPORT

Magneto-Optical Properties of Quantum Structures with Reduced Dimensionality.  
AD-A282597 REPORT DATE: 31 MAR 94 FINAL REPORT

Materials Degradation and Fatigue Under Extreme Conditions.  
AD-A282969 REPORT DATE: MAR 94 ANNUAL REPORT

Materials for Second and Third Order Nonlinear Optical Applications.  
AD-A281304 REPORT DATE: 14 JUN 94 ANNUAL REPORT

Mathematical Analysis of Three Free-Electron-Laser Issues.  
AD-A284122 REPORT DATE: 30 NOV 93 FINAL REPORT

Mathematical Problems of Nonlinear Wave Propagation and of Waves in Heterogeneous Media.  
AD-A282217 REPORT DATE: 31 OCT 93 FINAL REPORT

Measurement and Regulation of Central Noradrenergic Receptors.  
AD-A284219 REPORT DATE: 30 NOV 93 ANNUAL REPORT

Measurements and Simulations of Particle Dispersion in a Turbulent Flow,  
AD-A280973 REPORT DATE: 92 ANNUAL REPORT

Measurements of Droplet Dispersion in Heated and Unheated Turbulent Jets.  
AD-A284252 REPORT DATE: APR 94 FINAL REPORT

Mechanistic Models of Soot Formation.  
AD-A284257 REPORT DATE: 20 JUL 94 FINAL REPORT

Microcomputer-Based Aircraft Routing and Scheduling. Phase 2.  
AD-A282930 REPORT DATE: 08 JUN 94 FINAL REPORT

Molecular Probes and Bioluminescent Reporters in Ecological Optimization of Biodegradation. (FY 91 AASERT).  
AD-A284170 REPORT DATE: 31 MAY 94 ANNUAL REPORT

TITLE INDEX 6

UNCLASSIFIED T4035K

LAS - MOL

## UNCLASSIFIED

## TITLE INDEX

Multi-Functional pi-Conjugated Macromolecules Based on Poly(Phenylene Vinylene).  
AD-A284163 REPORT DATE: 14 MAR 94 ANNUAL REPORT

NCL(B) Based Short Wavelength Chemical Laser.  
AD-A284213 REPORT DATE: 14 FEB 94 FINAL REPORT

Near-Infrared to Blue Energy Upconversion in LaF(3):Ho3+.  
AD-A282785 REPORT DATE: MAY 94 ANNUAL REPORT

Neurophysiological Analysis of Circadian Rhythm Entrainment.  
AD-A280981 REPORT DATE: 24 MAY 94 ANNUAL REPORT

New Mechanisms and New Materials for Organic Optical Nonlinearity.  
AD-A282781 REPORT DATE: 01 JUN 94 ANNUAL REPORT

A New Multi-Dimensional Transform for Digital Signal Processing Using Generalized Association Schemes.  
AD-A284166 REPORT DATE: 31 MAY 94 FINAL REPORT

Nonlinear Optical and Charge Distribution Studies Probing Electric Field Effects in Polymer Thin Films for Second Order Nonlinear Optics.  
AD-A280980 REPORT DATE: 03 MAY 94 ANNUAL REPORT

Novel Polymeric Composites Through Molecular Engineering.  
AD-A284168 REPORT DATE: 30 JUN 94 ANNUAL REPORT

Numerical Studies of Low Temperature Gallium Arsenide Buffer Layers and Their Influence on Device Operation.  
AD-A281156 REPORT DATE: 17 JUN 94 FINAL REPORT

A Parallel Processing Hypothesis for Short-Term and Long-Term Memory in Aplysia.  
AD-A284101 REPORT DATE: 30 APR 94 ANNUAL REPORT

Paramagnetic Interactions of Triplet Radical Pairs with Nitroxide Radicals: An 'Antiscavenging' Effect.  
AD-A282855 REPORT DATE: 94 FINAL REPORT

Perception of Auditory Events: Attentional Limitations.  
AD-A284399 REPORT DATE: 26 JUL 94 ANNUAL REPORT

Perception of Complex Auditory Patterns.  
AD-A284189 REPORT DATE: 14 SEP 93 ANNUAL REPORT

Phase and Amplitude Controlled Micropatch Antenna.  
AD-A284191 REPORT DATE: 28 JUL 94 FINAL REPORT

Phase-Shifting Effects of Light and Activity on the Human Circadian Clock.  
AD-A281204 REPORT DATE: 28 FEB 94 FINAL REPORT

Photodissociation Spectroscopy of Mg+ -Rare Gas Complexes.  
AD-A283194 REPORT DATE: 01 JUN 94 FINAL REPORT

TITLE INDEX 7

MUL - PHO

UNCLASSIFIED T4035K

UNCLASSIFIED

TITLE INDEX

Photogeneration and Characterization of Energetic Molecules in Supersonic Molecular Beams.  
AD-A284108 REPORT DATE: 24 JUN 94 FINAL REPORT

Photonic Computer Links Using Multi-Channel Vertical-Cavity Surface-Emitting Laser Arrays.  
AD-B186566L REPORT DATE: 11 MAY 94 FINAL REPORT

Polyhedral Approaches for Solving 0-1 Polynomial Programming Problems.  
AD-A282448 REPORT DATE: JUN 94 FINAL REPORT

Polymer Fibers for Nonlinear Optics.  
AD-A284216 REPORT DATE: 30 APR 94 ANNUAL REPORT

Polymer-Polymer Interactions.  
AD-A282944 REPORT DATE: 30 JAN 94 FINAL REPORT

Precipitation of Poly(L-Lactic Acid) and Composite Poly(L-Lactic Acid)-Pyrene Particles by Rapid Expansion of Supercritical Solutions,  
AD-A284199 REPORT DATE: 94 FINAL REPORT

Presentations of Shape in Object Recognition and Long-Term Visual Memory.  
AD-A281336 REPORT DATE: 05 APR 94 ANNUAL REPORT

Processes Involved in the Integration of Pictures and Discourse.  
AD-A282942 REPORT DATE: 01 JUN 93 ANNUAL REPORT

Processing and Characterization of Mechanically Alloyed NiAl-Based Alloys.  
AD-A283959 REPORT DATE: 20 JUL 94 FINAL REPORT

Property Control of (Perfluorinated Ionomer)/(Inorganic Oxide) Composites by Tailoring the Nanoscale Morphology.  
AD-A281370 REPORT DATE: 10 JUN 94 ANNUAL REPORT

Quantum Well and Superlattice IR Detector Development. Phase 1.  
AD-B187142 REPORT DATE: FEB 94 FINAL REPORT

Rational Design, Construction, and Processing of High-Performance Nonlinear, Optical Materials.  
AD-A281283 REPORT DATE: 01 JUN 94 FINAL REPORT

Reactions of Atmospheric Cluster Ions.  
AD-A282598 REPORT DATE: 28 JUN 94 ANNUAL REPORT

Reconstruction of Shapes from Shading and Shape Based Image Reconstruction Using Modern Nonlinear Analysis.  
AD-A284107 REPORT DATE: 20 JUN 94 FINAL REPORT

Relativistic Effects at the Correlated Level. An Application to Interhalogens,  
AD-A284145 REPORT DATE: 31 DEC 93 ANNUAL REPORT

Research on Organofluorine Chemistry for 700 Degrees F Thermooxidative Stability.  
AD-A282757 REPORT DATE: 29 JUN 94 FINAL REPORT

TITLE INDEX 8

UNCLASSIFIED T4035K

PHO - RES

## UNCLASSIFIED

## TITLE INDEX

Research Training For Understanding the Fate of Environmental Pollutants. (FY91 AASERT).  
AD-A284164 REPORT DATE: 31 MAY 94 ANNUAL REPORT

Research Training of the Effects of Toxic Substances on the Lungs. (FY91 AASERT).  
AD-A284165 REPORT DATE: 31 MAY 94 ANNUAL REPORT

Resonant Charge Transfer in Hyperthermal Atomic and Molecular Ion-Surface Collisions.  
AD-A281369 REPORT DATE: 14 APR 94 ANNUAL REPORT

The Role of Chemical Inhibition of Gap Junctional Intercellular Communication in Toxicology.  
AD-A282452 REPORT DATE: 14 JUN 94 ANNUAL REPORT

The Role of Excited Molecular Iodine in the Chemical Oxygen Iodine Laser,  
AD-A282735 REPORT DATE: 23 JUN 94 FINAL REPORT

SAM1 Semiempirical Parameters.  
AD-A284400 REPORT DATE: 10 AUG 94 ANNUAL REPORT

Shaped Strain Sensors for Intelligent Structures.  
AD-A282333 REPORT DATE: 03 JUN 94 FINAL REPORT

Signal-Software Tools for Signal Identification Using Neural Networks.  
AD-A284362 REPORT DATE: 15 JUL 94 FINAL REPORT

A Simulation of Particle Dispersion in a Turbulent Jet,  
AD-A280930 REPORT DATE: 92 ANNUAL REPORT

Single Crystal Films and Waveguides of Organic Materials: Preparation and Nonlinear Optical Properties.  
AD-A284471 REPORT DATE: 31 MAR 94 ANNUAL REPORT

Situational Awareness in Complex Systems.  
AD-A281448 REPORT DATE: 31 JAN 94 FINAL REPORT

Solute-Solute Interactions: Theory and Simulations,  
AD-A284226 REPORT DATE: 94 FINAL REPORT

Spatially Resolved Measurements of Soot Volume Fraction Using Laser-Induced Incandescence.  
AD-A282562 REPORT DATE: 94 FINAL REPORT

Spectroelectrochemical Investigations of Molten Halide Solutions.  
AD-A284147 REPORT DATE: 16 JUN 94 ANNUAL REPORT

Spectroscopy of Metastable Species in a Free-Jet Expansion: The D' to A' (Reverse) Transition of IBr.  
AD-A282563 REPORT DATE: 94 FINAL REPORT

Stochastic Control and Nonlinear Estimation.  
AD-A281219 REPORT DATE: 19 MAY 94 FINAL REPORT

Structural Integrity of Intelligent Materials and Structures.  
AD-A280941 REPORT DATE: 17 FEB 94 FINAL REPORT

TITLE INDEX 9

RES - STR

UNCLASSIFIED T4035K

UNCLASSIFIED

TITLE INDEX

Structural Integrity of Intelligent Materials and Structures. Constitutive Modeling of Shape Memory Alloys.  
AD-A281301 REPORT DATE: MAY 94 FINAL REPORT

Structure-Activity Relationships of Chlorinated Alicyclic Compounds in Catfish.  
AD-A280927 REPORT DATE: 14 AUG 93 ANNUAL REPORT

Studies of Optical Phase Conjugators and Applications.  
AD-A282626 REPORT DATE: 30 SEP 93 FINAL REPORT

Studies on high Pressure and Unsteady Flame Phenomena.  
AD-A284126 REPORT DATE: 20 JUN 94 ANNUAL REPORT

Study of a Navier-Stokes Computer.  
AD-A284196 REPORT DATE: 14 JUL 94 FINAL REPORT

Superconductor Magnetic Memory'.  
AD-B189498L REPORT DATE: 07 SEP 94 FINAL REPORT

Supercritical Fluids in Particle Formation Media.  
AD-A284217 REPORT DATE: 94 ANNUAL REPORT

Surface Reactivity of Combustion Generated Soot Particles.  
AD-A284092 REPORT DATE: 12 JUL 94 ANNUAL REPORT

The Synthesis and Characterization of Radical Cation Salts of Bis(Ethylenedithio)Tetraselenafulvalene,  
AD-A281118 REPORT DATE: 93 FINAL REPORT

Synthesis, Superconductivity, X-ray Structure and Electronic Band Structure of Wavelengths-(BETS)2GaCl4,  
AD-A281224 REPORT DATE: 94 FINAL REPORT

Systematic Optimization of Second Order Nonlinear Optical Materials.  
AD-A281350 REPORT DATE: 14 JUN 94 ANNUAL REPORT

A Technique for Measuring Lagrangian and Eulerian Particle Statistics in a Turbulent Flow,  
AD-A280932 REPORT DATE: 91 ANNUAL REPORT

Theoretical and Experimental Studies of Laser-Initiated Detonation Waves for Supersonic Combustion,  
AD-A280984 REPORT DATE: JAN 93 FINAL REPORT

Theoretical Determination of Charge-Transfer and Ligand Field Transition Energies for FeCl4 - Using the EDM-CCSD Method,  
AD-A284198 REPORT DATE: 94 FINAL REPORT

Theoretical Modeling of Ocular Tissue Damage by Short Pulse Laser.  
AD-A280928 REPORT DATE: 27 MAY 94 ANNUAL REPORT

A Theoretical Study of Hyperfine Coupling Constants.  
AD-A284440 REPORT DATE: 15 JAN 94 ANNUAL REPORT

Theories of Turbulent Combustion in High Speed Flows.  
AD-A280933 REPORT DATE: 25 MAY 94 ANNUAL REPORT

TITLE INDEX 10

STR - THE

UNCLASSIFIED

T4035K

## UNCLASSIFIED

## TITLE INDEX

Thermal Relaxation Processes and Stability in Poled Electro-Optic Polymers.  
AD-A283948 REPORT DATE: 30 JUN 94 ANNUAL REPORT

Thermodynamics of the Anion Ordering Transitions in (TMTSF)2ReO4 and (TMTSF)2BF4,  
AD-A281119 REPORT DATE: 01 OCT 93 FINAL REPORT

Time-Resolved, High-Resolution, X-Ray Microscopy of In-Vitro Biological and Life Science Specimens with the Aid of Laser Plasmas.  
AD-A283200 REPORT DATE: 30 JUN 94 FINAL REPORT

Transonic Flow Separation in Closed Curved Channels.  
AD-A280728 REPORT DATE: APR 94 FINAL REPORT

Transplantations and Cloning of an Immortal Cell Line from Rat SCN.  
AD-A280978 REPORT DATE: 31 MAY 94 FINAL REPORT

Ultrashort Laser Pulse Effects in Ocular and Related Media: Laser-Induced Shock Wave Propagation and Retinal Damage.  
AD-A282599 REPORT DATE: JUN 94 ANNUAL REPORT

Vibrational Specificity for Charge Transfer Versus Deactivation in  $N_2^+(v = 0, 1, 2) + Ar$  and  $O_2$  Reactions,  
AD-A284200 REPORT DATE: 07 JUL 94 FINAL REPORT

Visual Motion Perception and Visual Information Processing.  
AD-A282928 REPORT DATE: 28 FEB 94 FINAL REPORT

Visual Psychophysics of Egomotion.  
AD-A282547 REPORT DATE: 30 JUN 94 FINAL REPORT

Visuo-Ocular Performance During Vestibular Stimulation.  
AD-A284103 REPORT DATE: 30 JUN 94 ANNUAL REPORT

Wavelength-Encoded Processing in Semiconductor Lasers.  
AD-A282649 REPORT DATE: JUN 94 FINAL REPORT

Wavelets and Scattering.  
AD-A284131 REPORT DATE: 29 JUL 94 FINAL REPORT

TITLE INDEX 11

THE - WAV

UNCLASSIFIED T4035K

## **SUBJECT INDEX**

UNCLASSIFIED  
SUBJECT INDEX

- \*ACIDS  
HEPATIC TOXICITY OF  
PERFLUOROCARBOXYLIC ACIDS.  
AD-A281 310
- \*ACTINIDE SERIES COMPOUNDS  
LASER SPECTROSCOPY OF UO:  
CHARACTERIZATION AND ASSIGNMENT OF  
STATES IN THE 0- TO 3-EV RANGE, WITH  
A COMPARISON TO THE ELECTRONIC  
STRUCTURE OF THO.  
AD-A282 546
- \*ACTIVATION  
IN SITU LASER ACTIVATION OF  
ELECTROCHEMICAL KINETICS AT CARBON  
ELECTRODES.  
AD-A280 892
- \*ACTUATORS  
STRUCTURAL INTEGRITY OF INTELLIGENT  
MATERIALS AND STRUCTURES.  
CONSTITUTIVE MODELING OF SHAPE MEMORY  
ALLOYS.  
AD-A281 301
- \*AIR BREATHING ENGINES  
THEORETICAL AND EXPERIMENTAL STUDIES  
OF LASER-INITIATED DETONATION WAVES  
FOR SUPERSONIC COMBUSTION.  
AD-A280 984  
LASER-INITIATED CONICAL DETONATION  
WAVE FOR SUPERSONIC COMBUSTION. 2,  
AD-A280 985
- \*AIR FLOW  
HYPERVELOCITY AIR FLOWS WITH FINITE  
RATE CHEMISTRY.  
AD-A284 727
- \*AIR FORCE RESEARCH  
AIR FORCE OFFICE OF SCIENTIFIC  
RESEARCH, RESEARCH PROPOSAL,  
QUARTERLY STATUS REPORT OCTOBER-  
DECEMBER 1993.  
AD-A282 939  
AIR FORCE ENGINEERING RESEARCH  
INITIATION GRANT PROGRAM.
- AD-A284 028
- \*AIRFRAMES  
HIGH TEMPERATURE LIQUID MICROPROBE FOR  
EDDY CURRENT EVALUATION OF AIRFRAMES.  
AD-B189 350L
- \*ALCOHOLS  
HYDROLYSIS AND CONDENSATION OF TIN  
(IV) ALKOXIDE COMPOUNDS: THE CONTROL  
OF STRUCTURAL EVOLUTION.  
AD-A282 789
- \*ALGEBRA  
A NEW MULTI-DIMENSIONAL TRANSFORM FOR  
DIGITAL SIGNAL PROCESSING USING  
GENERALIZED ASSOCIATION SCHEMES.  
AD-A284 166
- \*ALGORITHMS  
POLYHEDRAL APPROACHES FOR SOLVING 0-1  
POLYNOMIAL PROGRAMMING PROBLEMS.  
AD-A282 448  
RECONSTRUCTION OF SHAPES FROM SHADING  
AND SHAPE BASED IMAGE RECONSTRUCTION  
USING MODERN NONLINEAR ANALYSIS.  
AD-A284 107
- \*ALKENES  
RESEARCH ON ORGANOFLUORINE CHEMISTRY  
FOR 700 DEGREES F THERMOOXIDATIVE  
STABILITY.  
AD-A282 767
- \*ALLOYS  
FUNDAMENTAL CONCEPTS RELATING LOCAL  
ATOMIC ARRANGEMENTS, DEFORMATION, AND  
FRACTURE OF INTERMETALLIC ALLOYS.  
AD-A282 971
- \*ALUMINATES  
AASERT-93: ELECTROPLATING OF  
REFRACTORY METALS USING HALOALUMINATE  
MELTS.  
AD-A284 859
- \*ALUMINIDES  
PROCESSING AND CHARACTERIZATION OF  
MECHANICALLY ALLOYED NIAL-BASED
- ALLOYS.  
AD-A283 959
- \*AMINES  
RESEARCH ON ORGANOFLUORINE CHEMISTRY  
FOR 700 DEGREES F THERMOOXIDATIVE  
STABILITY.  
AD-A282 767
- \*AMPLITUDE  
LARGE AMPLITUDE MOTIONS, ESPECIALLY  
ISOMERIZATION AND TUNNELING IN  
POLYATOMIC MOLECULE SPECTRA: NOVEL  
EXPERIMENTAL, PATTERN RECOGNITION,  
AND THEORETICAL METHODS.  
AD-A284 194
- \*ANIONS  
THERMODYNAMICS OF THE ANION ORDERING  
TRANSITIONS IN (TMTSF)2REO4 AND  
(TMTSF)2BF4.  
AD-A281 119  
THEORETICAL DETERMINATION OF CHARGE-  
TRANSFER AND LIGAND FIELD TRANSITION  
ENERGIES FOR FECL4 - USING THE EOM-  
CCSD METHOD,  
AD-A284 198
- \*ANISOTROPY  
FIRST-PRINCIPLES-DERIVED RATE  
CONSTANTS FOR H ADATOM SURFACE  
DIFFUSION ON SI(100)-2X1,  
AD-A284 143
- \*ANTENNA ARRAYS  
PHASE AND AMPLITUDE CONTROLLED  
MICROPATCH ANTENNA.  
AD-A284 191
- \*ANTENNA RADIATION PATTERNS  
PHASE AND AMPLITUDE CONTROLLED  
MICROPATCH ANTENNA.  
AD-A284 191
- \*ANTENNAS  
GEOMETRICAL AND TOPOLOGICAL METHODS  
IN TIME DOMAIN ANTENNA SYNTHESIS.  
AD-A284 208



UNCLASSIFIED  
SUBJECT INDEX

\*ANTHRACENES  
ELECTROCHEMICAL AND SPECTROSCOPY  
STUDIES OF SELECTED INORGANIC AND  
ORGANIC SYSTEMS IN MOLTEN HALIDES.  
AD-A284 171

\*APTITUDES  
COGNITIVE/SELF-REGULATORY APTITUDES  
AND INSTRUCTIONAL METHODS FOR COMPLEX  
SKILL LEARNING.  
AD-A280 937

\*AQUIFERS  
CHARACTERIZATION OF HETEROGENEITIES  
CONTROLLING TRANSPORT AND FATE OF  
POLLUTANTS IN UNCONSOLIDATED SAND AND  
GRAVEL AQUIFERS: THIRD YEAR REPORT.  
AD-A284 193

\*ARGON  
VIBRATIONAL SPECIFICITY FOR CHARGE  
TRANSFER VERSUS DEACTIVATION IN  $N_2^+(V$   
 $= 0, 1, 2) + AR$  AND  $O_2$  REACTIONS.  
AD-A284 200

\*ARGON LASERS  
THEORETICAL AND EXPERIMENTAL STUDIES  
OF LASER-INITIATED DETONATION WAVES  
FOR SUPERSONIC COMBUSTION,  
AD-A280 984

\*AROMATIC COMPOUNDS  
SYSTEMATIC OPTIMIZATION OF SECOND  
ORDER NONLINEAR OPTICAL MATERIALS.  
AD-A281 350

\*AROMATIC HYDROCARBONS  
MOLECULAR PROBES AND BIOLUMINESCENT  
REPORTERS IN ECOLOGICAL OPTIMIZATION  
OF BIODEGRADATION. (FY 91 AASERT).  
AD-A284 170

\*ARTIFICIAL INTELLIGENCE  
STRUCTURAL INTEGRITY OF INTELLIGENT  
MATERIALS AND STRUCTURES.  
CONSTITUTIVE MODELING OF SHAPE MEMORY  
ALLOYS.  
AD-A281 301

\*AUDITORY PERCEPTION

STRUCTURES.  
AD-A282 333  
VISUAL MOTION PERCEPTION AND VISUAL  
INFORMATION PROCESSING.  
AD-A282 928  
DEVELOPMENT OF TECHNIQUES FOR THE  
EVALUATION OF TOXICANT IMPACTS TO  
MULTISPECIES SYSTEMS.  
AD-A284 426

\*ATMOSPHERICS  
REACTIONS OF ATMOSPHERIC CLUSTER IONS.  
AD-A282 598

\*ATOMIC ORBITALS  
A THEORETICAL STUDY OF HYPERFINE  
COUPLING CONSTANTS.  
AD-A284 440

\*ATOMIC PROPERTIES  
ATOMIC PROCESSES RELEVANT TO  
ANTIMATTER FUEL PRODUCTION AND  
STORAGE.  
AD-A280 938  
RESONANT CHARGE TRANSFER IN  
HYPERTHERMAL ATOMIC AND MOLECULAR ION-  
SURFACE COLLISIONS.  
AD-A281 369

\*ATOMIC STRUCTURE  
FUNDAMENTAL CONCEPTS RELATING LOCAL  
ATOMIC ARRANGEMENTS, DEFORMATION, AND  
FRACTURE OF INTERMETALLIC ALLOYS.  
AD-A282 971

\*ATOMS  
BORON ATOM MATRIX CHEMISTRY.  
AD-A282 840  
FIRST-PRINCIPLES-DERIVED RATE  
CONSTANTS FOR H ADATOM SURFACE  
DIFFUSION ON  $Si(100)-2 \times 1$ ,  
AD-A284 143  
DIFFUSION OF HYDROGEN ATOMS ON A  
 $Si(111)-(7 \times 7)$  RECONSTRUCTED SURFACE:  
MONTE CARLO VARIATIONAL PHASE-SPACE  
THEORY.  
AD-A284 205

PERCEPTION OF COMPLEX AUDITORY  
PATTERNS.  
AD-A284 189  
PERCEPTION OF AUDITORY EVENTS:  
ATTENTIONAL LIMITATIONS.  
AD-A284 399

\*BACTERIAL TOXINS  
BIOTRANSFORMATION OF TOXIC METALS BY  
BACTERIA.  
AD-A280 893

\*BEHAVIORAL SCIENCES  
MEASUREMENT AND REGULATION OF CENTRAL  
NORADRENERGIC RECEPTORS.  
AD-A284 219

\*BENZOPHENONES  
ASSERT-92: A NOVEL PHOTOCHEMICAL AND  
INTERFACIAL APPROACH TO THE  
DEGRADATION OF HAZARDOUS MATERIALS.  
AD-A282 618

\*BENZOXAZOLES  
NOVEL POLYMERIC COMPOSITES THROUGH  
MOLECULAR ENGINEERING.  
AD-A284 168

\*BERYLLIUM  
BORON ATOM MATRIX CHEMISTRY.  
AD-A282 840

\*BINARY COMPOUNDS  
HIGH TEMPERATURE STABILITY OF BINARY  
MICROSTRUCTURES DERIVED FROM LIQUID  
PRECURSORS.  
AD-A283 960

\*BINOCULARS  
COORDINATED ACTION IN 3-D SPACE.  
AD-A281 284

\*BIODEGRADATION  
GEOCHEMICAL, GENETIC AND  
PHYSIOLOGICAL CONTROL OF POLLUTANT  
BIODEGRADATION.  
AD-A280 931

\*BIODETERIORATION

SHAPED STRAIN SENSORS FOR INTELLIGENT

SUBJECT INDEX- 2  
UNCLASSIFIED T4035K

ANT-BIO

UNCLASSIFIED  
SUBJECT INDEX

MOLECULAR PROBES AND BIOLUMINESCENT REPORTERS IN ECOLOGICAL OPTIMIZATION OF BIODEGRADATION. (FY 91 AASERT).  
AD-A284 170

\*BIOLOGICAL RHYTHMS  
TRANSPLANTATIONS AND CLONING OF AN IMMORTAL CELL LINE FROM RAT SCN.  
AD-A280 978

\*BIOLOGY  
DEVELOPMENT OF TECHNIQUES FOR THE EVALUATION OF TOXICANT IMPACTS TO MULTISPECIES SYSTEMS.  
AD-A284 426

\*BIOLUMINESCENCE  
MOLECULAR PROBES AND BIOLUMINESCENT REPORTERS IN ECOLOGICAL OPTIMIZATION OF BIODEGRADATION. (FY 91 AASERT).  
AD-A284 170

\*BIOMOLECULES  
THEORETICAL DETERMINATION OF CHARGE-TRANSFER AND LIGAND FIELD TRANSITION ENERGIES FOR FECL<sub>4</sub> - USING THE EOM-CCSD METHOD.  
AD-A284 198

\*BLOCK COPOLYMERS  
MULTI-FUNCTIONAL PI-CONJUGATED MACROMOLECULES BASED ON POLY(PHENYLENE VINYLENE).  
AD-A284 163

\*BLUE(COLOR)  
NEAR-INFRARED TO BLUE ENERGY UPCONVERSION IN LAF(3):HO<sub>3</sub><sup>+</sup>.  
AD-A282 785

\*BORON  
THERMODYNAMICS OF THE ANION ORDERING TRANSITIONS IN (TMTSF)<sub>2</sub>REO<sub>4</sub> AND (TMTSF)<sub>2</sub>BF<sub>4</sub>.  
AD-A281 119  
BORON ATOM MATRIX CHEMISTRY.  
AD-A282 840

\*BRAIN

STRUCTURE-ACTIVITY RELATIONSHIPS OF CHLORINATED ALICYCLIC COMPOUNDS IN CATFISH.  
AD-A280 927

\*BROMIDES  
SPECTROSCOPY OF METASTABLE SPECIES IN A FREE-JET EXPANSION: THE D' TO A' (REVERSE) TRANSITION OF IBr.  
AD-A282 563

\*BUFFERS  
NUMERICAL STUDIES OF LOW TEMPERATURE GALLIUM ARSENIDE BUFFER LAYERS AND THEIR INFLUENCE ON DEVICE OPERATION.  
AD-A281 156

\*BUTANOLS  
HYDROLYSIS AND CONDENSATION OF TIN (IV) ALKOXIDE COMPOUNDS: THE CONTROL OF STRUCTURAL EVOLUTION.  
AD-A282 789

\*CADMIUM SULFIDES  
INTERNATIONAL COLLABORATION PROGRAM IN INNOVATIVE CHEMICAL PROCESSING OF SUPERIOR ELECTRONIC AND OPTICAL MATERIALS.  
AD-A282 946

\*CALORIMETRY  
AC CALORIMETRY AT CDW AND SDW TRANSITIONS,  
AD-A281 117

\*CARBOHYDRATE METABOLISM  
HEPATIC TOXICITY OF PERFLUOROCARBOXYLIC ACIDS.  
AD-A281 310

\*CARBON  
IN SITU LASER ACTIVATION OF ELECTROCHEMICAL KINETICS AT CARBON ELECTRODES.  
AD-A280 892  
CLUSTER IONS.  
AD-A282 615  
PARAMAGNETIC INTERACTIONS OF TRIPLET RADIAL PAIRS WITH NITROXIDE RADICALS:

AN 'ANTISCVENGING' EFFECT.  
AD-A282 855  
EXCHANGE INTERACTION IN MICELLIZED RADICAL PAIRS.  
AD-A283 195  
ACCURATE ELECTRON AFFINITIES OF SMALL CARBON CLUSTERS,  
AD-A284 434

\*CARBON MONOXIDE  
REACTIONS OF ATMOSPHERIC CLUSTER IONS.  
AD-A282 598

\*CATIONS  
THE SYNTHESIS AND CHARACTERIZATION OF RADICAL CATION SALTS OF BIS(ETHYLENEDITHIO) TETRASELENAFULVALENE,  
AD-A281 118

\*CELL DIVISION  
THE ROLE OF CHEMICAL INHIBITION OF GAP JUNCTIONAL INTERCELLULAR COMMUNICATION IN TOXICOLOGY.  
AD-A282 452

\*CEREBELLUM  
CEREBELLAR CIRCUIT MECHANISMS WHICH ACCOMPANY COORDINATED LIMB TRAJECTORY PATTERNS IN THE RAT: USE OF A MODEL OF SPONTANEOUS CHANGES IN LIMB COORDINATION.  
AD-A284 023

\*CHAOS  
DEVELOPMENT OF TECHNIQUES FOR THE EVALUATION OF TOXICANT IMPACTS TO MULTISPECIES SYSTEMS.  
AD-A284 426

\*CHARGE TRANSFER  
RESONANT CHARGE TRANSFER IN HYPERTHERMAL ATOMIC AND MOLECULAR ION-SURFACE COLLISIONS.  
AD-A281 369  
THEORETICAL DETERMINATION OF CHARGE-TRANSFER AND LIGAND FIELD TRANSITION ENERGIES FOR FECL<sub>4</sub> - USING THE EOM-CCSD METHOD,

UNCLASSIFIED  
SUBJECT INDEX

- AD-A284 198  
VIBRATIONAL SPECIFICITY FOR CHARGE  
TRANSFER VERSUS DEACTIVATION IN  $N_2^+(V$   
= 0, 1, 2) + AR AND O<sub>2</sub> REACTIONS,  
AD-A284 200
- \*CHEMICAL ENGINEERING  
INTERNATIONAL COLLABORATION PROGRAM  
IN INNOVATIVE CHEMICAL PROCESSING OF  
SUPERIOR ELECTRONIC AND OPTICAL  
MATERIALS.  
AD-A282 946
- \*CHEMICAL LASERS  
THE ROLE OF EXCITED MOLECULAR IODINE  
IN THE CHEMICAL OXYGEN IODINE LASER,  
AD-A282 735  
NCL(B) BASED SHORT WAVELENGTH  
CHEMICAL LASER.  
AD-A284 213
- \*CHEMICAL RADICALS  
THE SYNTHESIS AND CHARACTERIZATION OF  
RADICAL CATION SALTS OF  
BIS(ETHYLENEDITHIO)  
TETRASELENAFULVALENE,  
AD-A281 118
- \*CHEMICAL REACTIONS  
ASSERT-92: A NOVEL PHOTOCHEMICAL AND  
INTERFACIAL APPROACH TO THE  
DEGRADATION OF HAZARDOUS MATERIALS.  
AD-A282 618  
INTERACTION OF CHEMISTRY, TURBULENCE,  
AND SHOCK WAVES IN HYPERVELOCITY FLOW.  
AD-A282 941  
VIBRATIONAL SPECIFICITY FOR CHARGE  
TRANSFER VERSUS DEACTIVATION IN  $N_2^+(V$   
= 0, 1, 2) + AR AND O<sub>2</sub> REACTIONS,  
AD-A284 200
- \*CHEMISORPTION  
CHEMISORPTION ENERGETICS OF  
SUPERACTIVE CHLORINE CONTAINING  
SPECIES ON GALLIUM ARSENIDE SURFACES.  
AD-A281 311
- \*CHEMISTRY  
BORON ATOM MATRIX CHEMISTRY.
- AD-A282 840  
\*CHLORIDES  
GAS-SURFACE INTERACTIONS NEAR  
DISSOCIATION THRESHOLD.  
AD-A282 726  
THEORETICAL DETERMINATION OF CHARGE-  
TRANSFER AND LIGAND FIELD TRANSITION  
ENERGIES FOR  $FeCl_4^-$  - USING THE EOM-  
CCSD METHOD,  
AD-A284 198
- \*CHLORINATION  
STRUCTURE-ACTIVITY RELATIONSHIPS OF  
CHLORINATED ALICYCLIC COMPOUNDS IN  
CATFISH.  
AD-A280 927
- \*CHLORINE  
CHEMISORPTION ENERGETICS OF  
SUPERACTIVE CHLORINE CONTAINING  
SPECIES ON GALLIUM ARSENIDE SURFACES.  
AD-A281 311
- \*CHROMOPHORES  
RATIONAL DESIGN, CONSTRUCTION, AND  
PROCESSING OF HIGH-PERFORMANCE  
NONLINEAR, OPTICAL MATERIALS.  
AD-A281 283
- \*CIRCADIAN RHYTHMS  
CELL CULTURE AND TRANSPLANTATION OF  
THE SUPRACHIASMATIC CIRCADIAN  
PACEMAKER.  
AD-A280 977  
TRANSPLANTATIONS AND CLONING OF AN  
IMMORTAL CELL LINE FROM RAT SCN.  
AD-A280 978  
NEUROPHYSIOLOGICAL ANALYSIS OF  
CIRCADIAN RHYTHM ENTRAINMENT.  
AD-A280 981  
PHASE-SHIFTING EFFECTS OF LIGHT AND  
ACTIVITY ON THE HUMAN CIRCADIAN CLOCK.  
AD-A281 204  
BASIC MECHANISMS AND IMPLICATIONS OF  
NON-PHOTIC ENTRAINMENT OF CIRCADIAN  
RHYTHMICITY.  
AD-A283 180  
GRADUATE STUDENT TRAINING IN
- CHRONOBIOLOGY. (FY91 ASSERT). THE  
SUPRACHIASMATIC NUCLEUS CONTROLS THE  
CIRCADIAN RHYTHM OF HEART RATE VIA  
THE SYMPATHETIC NERVOUS SYSTEM.  
AD-A284 132  
CELLULAR ANALYSIS OF CIRCADIAN  
RHYTHMICITY IN CULTURED SCN NEURONS.  
AD-A284 167
- \*CLUSTERING  
REACTIONS OF ATMOSPHERIC CLUSTER IONS.  
AD-A282 598
- \*COGNITION  
COGNITIVE/SELF-REGULATORY APTITUDES  
AND INSTRUCTIONAL METHODS FOR COMPLEX  
SKILL LEARNING.  
AD-A280 937  
AUGMENTATION OF RESEARCH ON COGNITIVE  
CONTROL.  
AD-A280 956  
INTERDISCIPLINARY TRAINING IN LIFE  
SCIENCES (FY91 ASSERT).  
AD-A282 938
- \*COLLISIONS  
RESONANT CHARGE TRANSFER IN  
HYPERTHERMAL ATOMIC AND MOLECULAR ION-  
SURFACE COLLISIONS.  
AD-A281 369  
SOLUTE-SOLUTE INTERACTIONS: THEORY  
AND SIMULATIONS,  
AD-A284 226
- \*COMBUSTION  
THEORIES OF TURBULENT COMBUSTION IN  
HIGH SPEED FLOWS.  
AD-A280 933  
COMBUSTION INSTABILITY PHENOMENA OF  
IMPORTANCE TO LIQUID PROPELLANT  
ENGINES.  
AD-A284 780
- \*COMBUSTORS  
LASER-INITIATED CONICAL DETONATION  
WAVE FOR SUPERSONIC COMBUSTION. 2,  
AD-A280 985
- \*COMMUNICATION AND RADIO SYSTEMS

UNCLASSIFIED  
SUBJECT INDEX

PHASE AND AMPLITUDE CONTROLLED  
MICROPATCH ANTENNA.  
AD-A284 191

\*COMPILERS  
STUDY OF A NAVIER-STOKES COMPUTER.  
AD-A284 196

\*COMPOSITE MATERIALS  
PROPERTY CONTROL OF (PERFLUORINATED  
IONOMER)/(INORGANIC OXIDE) COMPOSITES  
BY TAILORING THE NANOSCALE MORPHOLOGY.  
AD-A281 370  
INTERNATIONAL COLLABORATION PROGRAM  
IN INNOVATIVE CHEMICAL PROCESSING OF  
SUPERIOR ELECTRONIC AND OPTICAL  
MATERIALS.  
AD-A282 946

FABRICATION OF BIOMIMETIC MOLECULAR  
LEVEL COMPOSITES.  
AD-A284 204  
ENHANCED QUANTUM DOT NONLINEAR  
OPTICALS MATERIALS.  
AD-B187 187

\*COMPREHENSION  
PROCESSES INVOLVED IN THE INTEGRATION  
OF PICTURES AND DISCOURSE.  
AD-A282 942

\*COMPUTATIONAL FLUID DYNAMICS  
COMPUTATIONAL METHODS FOR PDES IN  
FLOW CONTROL, SUPERCONDUCTIVITY,  
FLUID FLOWS AND OTHER APPLICATIONS.  
AD-A282 912

\*COMPUTATIONS  
LEAST SQUARES COMPUTATIONS IN SCIENCE  
AND ENGINEERING.  
AD-A281 213  
COMPUTATIONAL METHODS FOR  
MICROSTRUCTURE COVOLUME TECHNIQUES OF  
DISCRETIZATION.  
AD-A282 449

A FULL-DIMENSIONAL SEMICLASSICAL  
CALCULATION OF VIBRATIONAL MODE  
SELECTIVITY IN THE TUNNELING  
SPLITTING IN A PLANAR MODEL OF  
MALONALDEHYDE,

AD-A284 772

\*COMPUTER PROGRAMS  
AASERT-92 OBSERVATIONAL ANALYSIS OF  
THE ORIGIN OF NON-DOUBLE COUPLE  
SEISMIC SOURCES.  
AD-A281 158  
DEVELOPING GUIDED SEARCH 3.0. THE  
NEXT GENERATION OF A MODEL VISUAL  
SEARCH.  
AD-A283 956

\*COMPUTER VISION  
LOCAL SPATIO-TEMPORAL ANALYSIS IN  
VISION SYSTEMS.  
AD-A284 162  
COOPERATIVITY AND 3-D REPRESENTATION.  
AD-A284 203

\*COMPUTERIZED SIMULATION  
STUDY OF A NAVIER-STOKES COMPUTER.  
AD-A284 196  
HYPERVELOCITY AIR FLOWS WITH FINITE  
RATE CHEMISTRY.  
AD-A284 727

\*COMPUTERIZED TOMOGRAPHY  
LEAST SQUARES COMPUTATIONS IN SCIENCE  
AND ENGINEERING.  
AD-A281 213

\*CONDENSATION REACTIONS  
HYDROLYSIS AND CONDENSATION OF TIN  
(IV) ALKOXIDE COMPOUNDS: THE CONTROL  
OF STRUCTURAL EVOLUTION.  
AD-A282 789

\*CONDITIONED RESPONSE  
BIOLOGICAL AND THEORETICAL STUDIES OF  
ADAPTIVE NETWORKS: THE CONDITIONED  
RESPONSE.  
AD-A284 781

\*CONSTANTS  
COUPLED-CLUSTER CALCULATIONS OF  
INDIRECT NUCLEAR COUPLING CONSTANTS:  
THE IMPORTANCE OF NON-FERMI CONTACT  
CONTRIBUTIONS.  
AD-A284 130

\*CONSTRUCTION  
COOPERATIVITY AND 3-D REPRESENTATION.  
AD-A284 203

\*CONTAMINATION  
GEOCHEMICAL, GENETIC AND  
PHYSIOLOGICAL CONTROL OF POLLUTANT  
BIODEGRADATION.  
AD-A280 931

\*CONTOURS  
COOPERATIVITY AND 3-D REPRESENTATION.  
AD-A284 203

\*CONTRACT PROPOSALS  
AIR FORCE OFFICE OF SCIENTIFIC  
RESEARCH. RESEARCH PROPOSAL,  
QUARTERLY STATUS REPORT OCTOBER-  
DECEMBER 1993.  
AD-A282 939

\*COPOLYMERS  
NOVEL POLYMERIC COMPOSITES THROUGH  
MOLECULAR ENGINEERING.  
AD-A284 168  
AASERT 92 - SYNTHESIS AND PROPERTIES  
OF COMPLEX POLYARYLENE VINYLENES.  
AD-A284 215

\*CORRELATION  
LOCAL SPATIO-TEMPORAL ANALYSIS IN  
VISION SYSTEMS.  
AD-A284 162

\*COUPLINGS  
COUPLED-CLUSTER CALCULATIONS OF  
INDIRECT NUCLEAR COUPLING CONSTANTS:  
THE IMPORTANCE OF NON-FERMI CONTACT  
CONTRIBUTIONS,  
AD-A284 130

\*CRACKING(FRACTURING)  
CORNELL PROGRAM FOR THE DESIGN AND  
SYNTHESIS OF ADVANCED MATERIALS.  
AD-A281 352

\*CROSSLINKING(CHEMISTRY)  
RATIONAL DESIGN, CONSTRUCTION, AND

UNCLASSIFIED  
SUBJECT INDEX

PROCESSING OF HIGH-PERFORMANCE  
NONLINEAR, OPTICAL MATERIALS.  
AD-A281 283

\*CRYOGENIC PROPELLANTS  
ADVANCED CRYOGENIC PROPELLANTS.  
AD-A282 451

\*CURRENT DENSITY  
HIGH TEMPERATURE SUPERCONDUCTORS WITH  
IMPROVED CURRENT DENSITIES.  
AD-A282 996

\*DAMAGE  
THEORETICAL MODELING OF OCULAR TISSUE  
DAMAGE BY SHORT PULSE LASER.  
AD-A280 928

\*DEACTIVATION  
VIBRATIONAL SPECIFICITY FOR CHARGE  
TRANSFER VERSUS DEACTIVATION IN  $N_2^+(V$   
 $= 0, 1, 2) + AR$  AND  $O_2$  REACTIONS,  
AD-A284 200

\*DEFORMATION  
FUNDAMENTAL CONCEPTS RELATING LOCAL  
ATOMIC ARRANGEMENTS, DEFORMATION, AND  
FRACTURE OF INTERMETALLIC ALLOYS.  
AD-A282 971

HIGH TEMPERATURE FRACTURE MECHANISMS  
IN METALLIC MATRIX COMPOSITES  
PRODUCED BY SOLIDIFICATION TECHNIQUES.  
AD-A284 169

\*DEGRADATION  
ASSERT-92: A NOVEL PHOTOCHEMICAL AND  
INTERFACIAL APPROACH TO THE  
DEGRADATION OF HAZARDOUS MATERIALS.  
AD-A282 618

\*DETECTORS  
STRUCTURAL INTEGRITY OF INTELLIGENT  
MATERIALS AND STRUCTURES.  
CONSTITUTIVE MODELING OF SHAPE MEMORY  
ALLOYS.  
AD-A281 301

\*DETONATION WAVES  
THEORETICAL AND EXPERIMENTAL STUDIES

OF LASER-INITIATED DETONATION WAVES  
FOR SUPERSONIC COMBUSTION,  
AD-A280 984

LASER-INITIATED CONICAL DETONATION  
WAVE FOR SUPERSONIC COMBUSTION. 2,  
AD-A280 985

\*DIATOMIC MOLECULES  
SPECTROSCOPY OF METASTABLE SPECIES IN  
A FREE-JET EXPANSION: THE  $D'$  TO  $A'$   
(REVERSE) TRANSITION OF IBr.  
AD-A282 563

\*DIELECTRIC PROPERTIES  
WAVELETS AND SCATTERING.  
AD-A284 131

\*DIFFUSION  
FIRST-PRINCIPLES-DERIVED RATE  
CONSTANTS FOR H ADATOM SURFACE  
DIFFUSION ON  $Si(100)-2 \times 1$ ,  
AD-A284 143

DIFFUSION OF HYDROGEN ATOMS ON A  
 $Si(111)-(7 \times 7)$  RECONSTRUCTED SURFACE:  
MONTE CARLO VARIATIONAL PHASE-SPACE  
THEORY.  
AD-A284 205

\*DISCRETE FOURIER TRANSFORMS  
A NEW MULTI-DIMENSIONAL TRANSFORM FOR  
DIGITAL SIGNAL PROCESSING USING  
GENERALIZED ASSOCIATION SCHEMES.  
AD-A284 166

\*DISSOCIATION  
GAS-SURFACE INTERACTIONS NEAR  
DISSOCIATION THRESHOLD.  
AD-A282 726

\*DROPS  
MEASUREMENTS AND SIMULATIONS OF  
PARTICLE DISPERSION IN A TURBULENT  
FLOW,  
AD-A280 973

\*EARTHQUAKES  
ASSERT-92 OBSERVATIONAL ANALYSIS OF  
THE ORIGIN OF NON-DOUBLE COUPLE  
SEISMIC SOURCES.

AD-A281 158

\*ECLIPSES  
FUNDAMENTALS OF ASTRODYNAMICS.  
AD-B189 080

\*EDDY CURRENTS  
HIGH TEMPERATURE SQUID MICROPROBE FOR  
EDDY CURRENT EVALUATION OF AIRFRAMES.  
AD-B189 350L

\*ELASTIC PROPERTIES  
STRUCTURAL INTEGRITY OF INTELLIGENT  
MATERIALS AND STRUCTURES.  
CONSTITUTIVE MODELING OF SHAPE MEMORY  
ALLOYS.  
AD-A281 301

ENERGY DECAY AND CONTROL FOR ELASTIC  
AND VISCOELASTIC DISTRIBUTED  
PARAMETER SYSTEMS.  
AD-A281 312

\*ELASTIC WAVES  
MATHEMATICAL PROBLEMS OF NONLINEAR  
WAVE PROPAGATION AND OF WAVES IN  
HETEROGENEOUS MEDIA.  
AD-A282 217

\*ELECTRIC FIELDS  
ELECTRIC FIELD DEPENDENCE OF YOUNG'S  
MODULUS OF (TMTSF) $2PF_6$ ,  
AD-A281 324

\*ELECTROCHEMISTRY  
IN SITU LASER ACTIVATION OF  
ELECTROCHEMICAL KINETICS AT CARBON  
ELECTRODES.  
AD-A280 892

SPECTROELECTROCHEMICAL INVESTIGATIONS  
OF MOLTEN HALIDE SOLUTIONS.  
AD-A284 147

ELECTROCHEMICAL AND SPECTROSCOPY  
STUDIES OF SELECTED INORGANIC AND  
ORGANIC SYSTEMS IN MOLTEN HALIDES.  
AD-A284 171

\*ELECTRODES  
IN SITU LASER ACTIVATION OF  
ELECTROCHEMICAL KINETICS AT CARBON



UNCLASSIFIED  
SUBJECT INDEX

- ELECTRODES.  
AD-A280 892
- \*ELECTROMAGNETIC WAVE PROPAGATION  
LIGHT BEAM AND PULSE PROPAGATION IN  
NONLINEAR DIELECTRICS.  
AD-A282 548  
WAVELETS AND SCATTERING.  
AD-A284 131
- \*ELECTRON TRANSPORT  
ELECTRON TRANSPORT REACTIONS BETWEEN  
PYRENE AND METHYLVIOLGEN IN A MODEL  
BIOLOGICAL MEMBRANE.  
AD-A283 184
- \*ELECTRONIC STATES  
LASER SPECTROSCOPY OF UO:  
CHARACTERIZATION AND ASSIGNMENT OF  
STATES IN THE 0- TO 3-EV RANGE, WITH  
A COMPARISON TO THE ELECTRONIC  
STRUCTURE OF THO.  
AD-A282 546
- \*ELECTRONICS  
INTERNATIONAL COLLABORATION PROGRAM  
IN INNOVATIVE CHEMICAL PROCESSING OF  
SUPERIOR ELECTRONIC AND OPTICAL  
MATERIALS.  
AD-A282 946
- \*ELECTRONS  
ACCURATE ELECTRON AFFINITIES OF SMALL  
CARBON CLUSTERS,  
AD-A284 434
- \*ELECTROOPTICS  
SYSTEMATIC OPTIMIZATION OF SECOND  
ORDER NONLINEAR OPTICAL MATERIALS.  
AD-A281 350  
NEW MECHANISMS AND NEW MATERIALS FOR  
ORGANIC OPTICAL NONLINEARITY.  
AD-A282 781  
TIME-RESOLVED, HIGH-RESOLUTION, X-RAY  
MICROSCOPY OF IN-VITRO BIOLOGICAL AND  
LIFE SCIENCE SPECIMENS WITH THE AID  
OF LASER PLASMAS.  
AD-A283 200  
THERMAL RELAXATION PROCESSES AND
- STABILITY IN POLED ELECTRO-OPTIC  
POLYMERS.  
AD-A283 948
- \*ELECTROPLATING  
AASERT-93: ELECTROPLATING OF  
REFRACTORY METALS USING HALOALUMINATE  
MELTS.  
AD-A284 859
- \*ENERGETIC PROPERTIES  
CHEMISORPTION ENERGETICS OF  
SUPERACTIVE CHLORINE CONTAINING  
SPECIES ON GALLIUM ARSENIDE SURFACES.  
AD-A281 311
- \*ENERGY TRANSFER  
NEAR-INFRARED TO BLUE ENERGY  
UPCONVERSION IN  $\text{LaF}_3(3): \text{Ho}^{3+}$ .  
AD-A282 785  
CLASSICAL INTRAMOLECULAR ENERGY-  
TRANSFER RATES USING FOURIER  
TRANSFORM METHODS: FOUR-ATOM SYSTEMS,  
AD-A284 113
- \*EPITAXIAL GROWTH  
LOW TEMPERATURE GROWN AND HIGHLY NON-  
STOICHIOMETRIC GaAs AND RELATED  
MATERIALS.  
AD-A284 898
- \*ESTIMATES  
STOCHASTIC CONTROL AND NONLINEAR  
ESTIMATION.  
AD-A281 219
- \*EULER EQUATIONS  
A TECHNIQUE FOR MEASURING LAGRANGIAN  
AND EULERIAN PARTICLE STATISTICS IN A  
TURBULENT FLOW,  
AD-A280 932
- \*EXCITATION  
THE ROLE OF EXCITED MOLECULAR IODINE  
IN THE CHEMICAL OXYGEN IODINE LASER,  
AD-A282 735
- \*EXCITONS  
MAGNETO-OPTICAL PROPERTIES OF QUANTUM
- STRUCTURES WITH REDUCED  
DIMENSIONALITY.  
AD-A282 597
- \*EXERCISE(PHYSIOLOGY)  
BASIC MECHANISMS AND IMPLICATIONS OF  
NON-PHOTIC ENTRAINMENT OF CIRCADIAN  
RHYTHMICITY.  
AD-A283 180
- \*EXPANSION  
PRECIPITATION OF POLY(L-LACTIC ACID)  
AND COMPOSITE POLY(L-LACTIC ACID)-  
PYRENE PARTICLES BY RAPID EXPANSION  
OF SUPERCRITICAL SOLUTIONS,  
AD-A284 199
- \*EXTRUSION  
PROCESSING AND CHARACTERIZATION OF  
MECHANICALLY ALLOYED NiAl-BASED  
ALLOYS.  
AD-A283 959
- \*EYE MOVEMENTS  
COORDINATED ACTION IN 3-D SPACE.  
AD-A281 284  
VISUAL PSYCHOPHYSICS OF EGOMOTION.  
AD-A282 547
- \*EYE PIGMENTS  
ALDEHYDIC PRODUCTS OF LIPID  
PEROXIDATION IN THE RETINA GENERATED  
BY ENVIRONMENTAL TOXINS.  
AD-A284 172
- \*FATIGUE(MECHANICS)  
MATERIALS DEGRADATION AND FATIGUE  
UNDER EXTREME CONDITIONS.  
AD-A282 969
- \*FIBER OPTICS  
POLYMER FIBERS FOR NONLINEAR OPTICS.  
AD-A284 216
- \*FINE GRAINED MATERIALS  
PROCESSING AND CHARACTERIZATION OF  
MECHANICALLY ALLOYED NiAl-BASED  
ALLOYS.  
AD-A283 959

- \*FINITE ELEMENT ANALYSIS  
COMPUTATIONAL METHODS FOR  
MICROSTRUCTURE COVOLUME TECHNIQUES OF  
DISCRETIZATION.  
AD-A282 449
- COMPUTATIONAL METHODS FOR PDES IN  
FLOW CONTROL, SUPERCONDUCTIVITY,  
FLUID FLOWS AND OTHER APPLICATIONS.  
AD-A282 912
- \*FISHES  
STRUCTURE-ACTIVITY RELATIONSHIPS OF  
CHLORINATED ALICYCLIC COMPOUNDS IN  
CATFISH.  
AD-A280 927
- \*FLAMES  
THEORIES OF TURBULENT COMBUSTION IN  
HIGH SPEED FLOWS.  
AD-A280 933
- STUDIES ON HIGH PRESSURE AND UNSTEADY  
FLAME PHENOMENA.  
AD-A284 126
- \*FLIGHT PATHS  
MICROCOMPUTER-BASED AIRCRAFT ROUTING  
AND SCHEDULING. PHASE 2.  
AD-A282 930
- \*FLIGHT SIMULATION  
HYPERVELOCITY FLOW SIMULATION,  
AD-A284 197
- \*FLOW FIELDS  
HYPERVELOCITY AIR FLOWS WITH FINITE  
RATE CHEMISTRY.  
AD-A284 727
- \*FLOW SEPARATION  
TRANSONIC FLOW SEPARATION IN CLOSED  
CURVED CHANNELS.  
AD-A280 728
- \*FLUIDS  
SUPERCRITICAL FLUIDS IN PARTICLE  
FORMATION MEDIA,  
AD-A284 217
- \*FLUORIDES  
THERMODYNAMICS OF THE ANION ORDERING  
TRANSITIONS IN (TMTSF)2RbO4 AND  
(TMTSF)2BF4,  
AD-A281 119
- NEAR-INFRARED TO BLUE ENERGY  
UPCONVERSION IN LAF(3):HO3+.  
AD-A282 785
- \*FLUORINATED HYDROCARBONS  
PROPERTY CONTROL OF (PERFLUORINATED  
IONOMER)/(INORGANIC OXIDE) COMPOSITES  
BY TAILORING THE NANOSCALE MORPHOLOGY.  
AD-A281 370
- \*FRACTURE(MECHANICS)  
FUNDAMENTAL CONCEPTS RELATING LOCAL  
ATOMIC ARRANGEMENTS, DEFORMATION, AND  
FRACTURE OF INTERMETALLIC ALLOYS.  
AD-A282 971
- \*FREE ELECTRON LASERS  
MATHEMATICAL ANALYSIS OF THREE FREE-  
ELECTRON-LASER ISSUES.  
AD-A284 122
- \*FREE RADICALS  
PARAMAGNETIC INTERACTIONS OF TRIPLET  
RADIAL PAIRS WITH NITROXIDE RADICALS:  
AN 'ANTISCRAVENGING' EFFECT.  
AD-A282 855
- \*FREQUENCY DOMAIN  
GEOMETRICAL AND TOPOLOGICAL METHODS  
IN TIME DOMAIN ANTENNA SYNTHESIS.  
AD-A284 208
- \*FRUITS  
DEVELOPING GUIDED SEARCH 3.0. THE  
NEXT GENERATION OF A MODEL VISUAL  
SEARCH.  
AD-A283 956
- \*FUEL ADDITIVES  
DEVELOPMENT OF OXYGEN SCAVENGER  
ADDITIVES FOR JET FUELS.  
AD-A281 307
- \*FUELS
- ATOMIC PROCESSES RELEVANT TO  
ANTIMATTER FUEL PRODUCTION AND  
STORAGE.  
AD-A280 938
- \*FULLERENES  
CLUSTER IONS.  
AD-A282 615
- \*GADOLINIUM  
LASER SPECTROSCOPY OF GdO: LIGAND  
FIELD ASSIGNMENTS OF 4F7(8S)6P  
REVERSING 4F7(8)6S TRANSITIONS,  
AD-A282 827
- \*GALLIUM ARSENIDES  
NUMERICAL STUDIES OF LOW TEMPERATURE  
GALLIUM ARSENIDE BUFFER LAYERS AND  
THEIR INFLUENCE ON DEVICE OPERATION.  
AD-A281 156
- CHEMISORPTION ENERGETICS OF  
SUPERACTIVE CHLORINE CONTAINING  
SPECIES ON GALLIUM ARSENIDE SURFACES.  
AD-A281 311
- LOW TEMPERATURE GROWN AND HIGHLY NON-  
STOICHIOMETRIC GaAs AND RELATED  
MATERIALS.  
AD-A284 898
- \*GAS SURFACE INTERACTIONS  
GAS-SURFACE INTERACTIONS NEAR  
DISSOCIATION THRESHOLD.  
AD-A282 726
- \*GASES  
VIBRATIONAL SPECIFICITY FOR CHARGE  
TRANSFER VERSUS DEACTIVATION IN N2+(V  
= 0, 1, 2) + AR AND O2 REACTIONS,  
AD-A284 200
- \*GAUSSIAN NOISE  
PERCEPTION OF COMPLEX AUDITORY  
PATTERNS.  
AD-A284 189
- \*GENES  
TRANSPLANTATIONS AND CLONING OF AN  
IMMORTAL CELL LINE FROM RAT SCN.  
AD-A280 978

UNCLASSIFIED  
SUBJECT INDEX

THE ROLE OF CHEMICAL INHIBITION OF  
GAP JUNCTIONAL INTERCELLULAR  
COMMUNICATION IN TOXICOLOGY.  
AD-A282 452

\*GRANTS  
AIR FORCE ENGINEERING RESEARCH  
INITIATION GRANT PROGRAM.  
AD-A284 028

\*GROUND STATE  
CONJUGATED POLYMERS WITH DEGENERATE  
GROUND STATE: THE ROUTE TO HIGH  
PERFORMANCE NLO RESPONSE. (F91  
ASSERT).  
AD-A283 958

\*GROUND WATER  
GEOCHEMICAL, GENETIC AND  
PHYSIOLOGICAL CONTROL OF POLLUTANT  
BIODEGRADATION.  
AD-A280 931

\*HALIDES  
SPECTROELECTROCHEMICAL INVESTIGATIONS  
OF MOLTEN HALIDE SOLUTIONS.  
AD-A284 147

\*HALOGENS  
SPECTROSCOPY OF METASTABLE SPECIES IN  
A FREE-JET EXPANSION: THE D' TO A'  
(REVERSE) TRANSITION OF IBr.  
AD-A282 563  
RELATIVISTIC EFFECTS AT THE  
CORRELATED LEVEL. AN APPLICATION TO  
INTERHALOGENS,  
AD-A284 145  
ASSERT-93: ELECTROPLATING OF  
REFRACTORY METALS USING HALOALUMINATE  
°MELTS.  
AD-A284 859

\*HAZARDOUS MATERIALS  
ASSERT-92: A NOVEL PHOTOCHEMICAL AND  
INTERFACIAL APPROACH TO THE  
DEGRADATION OF HAZARDOUS MATERIALS.  
AD-A282 618

\*HEART RATE

GRADUATE STUDENT TRAINING IN  
CHRONOBIOLOGY. (FY91 ASSERT). THE  
SUPRACHIASMATIC NUCLEUS CONTROLS THE  
CIRCADIAN RHYTHM OF HEART RATE VIA  
THE SYMPATHETIC NERVOUS SYSTEM.  
AD-A284 132

\*HIGH TEMPERATURE  
HIGH TEMPERATURE SUPERCONDUCTORS WITH  
IMPROVED CURRENT DENSITIES.  
AD-A282 996  
HIGH TEMPERATURE STABILITY OF BINARY  
MICROSTRUCTURES DERIVED FROM LIQUID  
PRECURSORS.  
AD-A283 960

\*HIGH TEMPERATURE SUPERCONDUCTORS  
HIGH TEMPERATURE SQUID MICROPROBE FOR  
EDDY CURRENT EVALUATION OF AIRFRAMES.  
AD-B189 350L  
SUPERCONDUCTOR MAGNETIC MEMORY'.  
AD-B189 498L

\*HOLMIUM  
NEAR-INFRARED TO BLUE ENERGY  
UPCONVERSION IN LAF(3):HO3+.  
AD-A282 785

\*HUMAN FACTORS ENGINEERING  
COORDINATED ACTION IN 3-D SPACE.  
AD-A281 284

\*HYDRAULICS  
CHARACTERIZATION OF HETEROGENEITIES  
CONTROLLING TRANSPORT AND FATE OF  
POLLUTANTS IN UNCONSOLIDATED SAND AND  
GRAVEL AQUIFERS: THIRD YEAR REPORT.  
AD-A284 193

\*HYDROGEN  
ADVANCED CRYOGENIC PROPELLANTS.  
AD-A282 451  
FIRST-PRINCIPLES-DERIVED RATE  
CONSTANTS FOR H ADATOM SURFACE  
DIFFUSION ON SI(100)-2X1,  
AD-A284 143  
DIFFUSION OF HYDROGEN ATOMS ON A  
SI(111)-(7X7) RECONSTRUCTED SURFACE:  
MONTE CARLO VARIATIONAL PHASE-SPACE

THEORY.  
AD-A284 205

\*HYDROLYSIS  
HYDROLYSIS AND CONDENSATION OF TIN  
(IV) ALKOXIDE COMPOUNDS: THE CONTROL  
OF STRUCTURAL EVOLUTION.  
AD-A282 789

\*HYPERSONIC FLOW  
INTERACTION OF CHEMISTRY, TURBULENCE,  
AND SHOCK WAVES IN HYPERVELOCITY FLOW.  
AD-A282 941

\*IGNITION  
THEORETICAL AND EXPERIMENTAL STUDIES  
OF LASER-INITIATED DETONATION WAVES  
FOR SUPERSONIC COMBUSTION,  
AD-A280 984

\*IMAGE PROCESSING  
LOCAL SPATIO-TEMPORAL ANALYSIS IN  
VISION SYSTEMS.  
AD-A284 162  
COOPERATIVITY AND 3-D REPRESENTATION.  
AD-A284 203  
COMPUTATIONAL VISION BASED ON  
NEUROBIOLOGY.  
AD-A284 472

\*IMAGE RESTORATION  
RECONSTRUCTION OF SHAPES FROM SHADING  
AND SHAPE BASED IMAGE RECONSTRUCTION  
USING MODERN NONLINEAR ANALYSIS.  
AD-A284 107

\*IMPINGEMENT  
COMBUSTION INSTABILITY PHENOMENA OF  
IMPORTANCE TO LIQUID PROPELLANT  
ENGINES.  
AD-A284 780

\*IN VITRO ANALYSIS  
IN VITRO SYSTEM FOR STUDYING  
METABOLISM OF ENVIRONMENTAL CHEMICALS  
IN HUMAN CELLS.  
AD-A284 174

\*INCANDESCENCE



UNCLASSIFIED  
SUBJECT INDEX

SPATIALLY RESOLVED MEASUREMENTS OF  
SOOT VOLUME FRACTION USING LASER-  
INDUCED INCANDESCENCE.  
AD-A282 562

\*INCLUSIONS  
INTERFACE MECHANICS OF PARTICULATE  
MEDIA WITH RIBBED INCLUSIONS.  
AD-A283 957

\*INDIVIDUALIZED TRAINING  
AUGMENTATION OF RESEARCH ON COGNITIVE  
CONTROL.  
AD-A280 956

\*INFORMATION PROCESSING  
STRUCTURAL INTEGRITY OF INTELLIGENT  
MATERIALS AND STRUCTURES.  
CONSTITUTIVE MODELING OF SHAPE MEMORY  
ALLOYS.  
AD-A281 301

\*INFRARED DETECTORS  
QUANTUM WELL AND SUPERLATTICE IR  
DETECTOR DEVELOPMENT. PHASE 1.  
AD-B187 142

\*INFRARED IMAGES  
LOCAL SPATIO-TEMPORAL ANALYSIS IN  
VISION SYSTEMS.  
AD-A284 162

\*INORGANIC COMPOUNDS  
PROPERTY CONTROL OF (PERFLUORINATED  
IONOMER)/(INORGANIC OXIDE) COMPOSITES  
BY TAILORING THE NANOSCALE MORPHOLOGY.  
AD-A281 370

\*INORGANIC MATERIALS  
FABRICATION OF BIOMIMETIC MOLECULAR  
LEVEL COMPOSITES.  
AD-A284 204

\*INSTABILITY  
COMBUSTION INSTABILITY PHENOMENA OF  
IMPORTANCE TO LIQUID PROPELLANT  
ENGINES.  
AD-A284 780

\*INTEGRAL EQUATIONS  
INTEGRAL EQUATION STUDY OF  
MICROSTRUCTURE AND SOLVATION IN MODEL  
ATTRACTIVE AND REPULSIVE  
SUPERCRITICAL MIXTURES.  
AD-A284 185

\*INTERACTIONS  
SOLUTE-SOLUTE INTERACTIONS: THEORY  
AND SIMULATIONS,  
AD-A284 226

\*INTERFACES  
ASSERT-92: A NOVEL PHOTOCHEMICAL AND  
INTERFACIAL APPROACH TO THE  
DEGRADATION OF HAZARDOUS MATERIALS.  
AD-A282 618  
INTERFACE MECHANICS OF PARTICULATE  
MEDIA WITH RIBBED INCLUSIONS.  
AD-A283 957

\*INTERMETALLIC COMPOUNDS  
FUNDAMENTAL CONCEPTS RELATING LOCAL  
ATOMIC ARRANGEMENTS, DEFORMATION, AND  
FRACTURE OF INTERMETALLIC ALLOYS.  
AD-A282 971

\*IODINE  
SPECTROSCOPY OF METASTABLE SPECIES IN  
A FREE-JET EXPANSION: THE D' TO A'  
(REVERSE) TRANSITION OF IBr.  
AD-A282 563  
THE ROLE OF EXCITED MOLECULAR IODINE  
IN THE CHEMICAL OXYGEN IODINE LASER,  
AD-A282 735

\*ION MOLECULE INTERACTIONS  
PHOTODISSOCIATION SPECTROSCOPY OF MG+  
-RARE GAS COMPLEXES,  
AD-A283 194

\*IONOMERS  
PROPERTY CONTROL OF (PERFLUORINATED  
IONOMER)/(INORGANIC OXIDE) COMPOSITES  
BY TAILORING THE NANOSCALE MORPHOLOGY.  
AD-A281 370

\*IONS  
REACTIONS OF ATMOSPHERIC CLUSTER IONS.

AD-A282 598

\*IRON  
THEORETICAL DETERMINATION OF CHARGE-  
TRANSFER AND LIGAND FIELD TRANSITION  
ENERGIES FOR FECL4 - USING THE EOM-  
CCSD METHOD,  
AD-A284 198  
SAM1 SEMIEMPIRICAL PARAMETERS.  
AD-A284 400

\*ISCHEMIA  
CUMULATIVE EFFECTS OF REPEATED BRIEF  
CEREBRAL ISCHEMIA.  
AD-A284 234

\*ISOMERIZATION  
LARGE AMPLITUDE MOTIONS, ESPECIALLY  
ISOMERIZATION AND TUNNELING IN  
POLYATOMIC MOLECULE SPECTRA: NOVEL  
EXPERIMENTAL, PATTERN RECOGNITION,  
AND THEORETICAL METHODS.  
AD-A284 194

\*ISOTOPE EFFECT  
EXCHANGE INTERACTION IN MICELLIZED  
RADICAL PAIRS.  
AD-A283 195

\*JET ENGINE FUELS  
THE CHRONIC EFFECTS ON JP-8 JET FUEL  
EXPOSURE ON THE LUNGS.  
AD-A280 982  
DEVELOPMENT OF OXYGEN SCAVENGER  
ADDITIVES FOR JET FUELS.  
AD-A281 307  
RESEARCH TRAINING OF THE EFFECTS OF  
TOXIC SUBSTANCES ON THE LUNGS. (FY91  
AASERT).  
AD-A284 165

\*JET FLOW  
COMBUSTION INSTABILITY PHENOMENA OF  
IMPORTANCE TO LIQUID PROPELLANT  
ENGINES.  
AD-A284 780

\*JET MIXING FLOW  
A TECHNIQUE FOR MEASURING LAGRANGIAN

UNCLASSIFIED  
SUBJECT INDEX

AND EULERIAN PARTICLE STATISTICS IN A  
TURBULENT FLOW,  
AD-A280 932

\*KINETICS

IN SITU LASER ACTIVATION OF  
ELECTROCHEMICAL KINETICS AT CARBON  
ELECTRODES.  
AD-A280 892  
HYDROLYSIS AND CONDENSATION OF TIN  
(IV) ALKOXIDE COMPOUNDS: THE CONTROL  
OF STRUCTURAL EVOLUTION.  
AD-A282 789

\*LAMINATES

STRUCTURAL INTEGRITY OF INTELLIGENT  
MATERIALS AND STRUCTURES.  
CONSTITUTIVE MODELING OF SHAPE MEMORY  
ALLOYS.  
AD-A281 301

\*LANTHANUM

NEAR-INFRARED TO BLUE ENERGY  
UPCONVERSION IN LAF(3):HO3+.  
AD-A282 785

\*LASER AMPLIFIERS

WAVELENGTH-ENCODED PROCESSING IN  
SEMICONDUCTOR LASERS.  
AD-A282 649

\*LASER DAMAGE

THEORETICAL MODELING OF OCULAR TISSUE  
DAMAGE BY SHORT PULSE LASER.  
AD-A280 928

\*LASER INDUCED FLUORESCENCE

FUNDAMENTAL STUDIES OF A HIGH ENERGY  
MOLECULAR SYSTEM: SPECTROSCOPY OF  
BORON IN HYDROGEN CLUSTERS. ASSERT-92.  
AD-A283 181

\*LASER MEDICAL DIAGNOSIS

ULTRASHORT LASER PULSE EFFECTS IN  
OCULAR AND RELATED MEDIA: LASER-  
INDUCED SHOCK WAVE PROPAGATION AND  
RETINAL DAMAGE.  
AD-A282 599

\*LASERS

IN SITU LASER ACTIVATION OF  
ELECTROCHEMICAL KINETICS AT CARBON  
ELECTRODES.  
AD-A280 892

LASER SPECTROSCOPY OF UO:  
CHARACTERIZATION AND ASSIGNMENT OF  
STATES IN THE 0- TO 3-EV RANGE, WITH  
A COMPARISON TO THE ELECTRONIC  
STRUCTURE OF THO.  
AD-A282 546

SPATIALLY RESOLVED MEASUREMENTS OF  
SOOT VOLUME FRACTION USING LASER-  
INDUCED INCANDESCENCE.  
AD-A282 562

LASER SPECTROSCOPY OF GDO: LIGAND  
FIELD ASSIGNMENTS OF 4F7(8S)6P  
REVERSING 4F7(8)6S TRANSITIONS,  
AD-A282 827

\*LAYERS

NUMERICAL STUDIES OF LOW TEMPERATURE  
GALLIUM ARSENIDE BUFFER LAYERS AND  
THEIR INFLUENCE ON DEVICE OPERATION.  
AD-A281 156

\*LEARNING

COGNITIVE/SELF-REGULATORY APTITUDES  
AND INSTRUCTIONAL METHODS FOR COMPLEX  
SKILL LEARNING.  
AD-A280 937

CEREBELLAR CIRCUIT MECHANISMS WHICH  
ACCOMPANY COORDINATED LIMB TRAJECTORY  
PATTERNS IN THE RAT: USE OF A MODEL  
OF SPONTANEOUS CHANGES IN LIMB  
COORDINATION.  
AD-A284 023

BIOLOGICAL AND THEORETICAL STUDIES OF  
ADAPTIVE NETWORKS: THE CONDITIONED  
RESPONSE.  
AD-A284 781

\*LEAST SQUARES METHOD

LEAST SQUARES COMPUTATIONS IN SCIENCE  
AND ENGINEERING.  
AD-A281 213

\*LIGANDS

LASER SPECTROSCOPY OF GDO: LIGAND

FIELD ASSIGNMENTS OF 4F7(8S)6P  
REVERSING 4F7(8)6S TRANSITIONS,  
AD-A282 827

THEORETICAL DETERMINATION OF CHARGE-  
TRANSFER AND LIGAND FIELD TRANSITION  
ENERGIES FOR FECL4 - USING THE EOM-  
CCSD METHOD,  
AD-A284 198

\*LIGHT PULSES

LIGHT BEAM AND PULSE PROPAGATION IN  
NONLINEAR DIELECTRICS.  
AD-A282 548

\*LIPIDS

ALDEHYDIC PRODUCTS OF LIPID  
PEROXIDATION IN THE RETINA GENERATED  
BY ENVIRONMENTAL TOXINS.  
AD-A284 172

\*LIQUID PROPELLANT ROCKET ENGINES

COMBUSTION INSTABILITY PHENOMENA OF  
IMPORTANCE TO LIQUID PROPELLANT  
ENGINES.  
AD-A284 780

\*LIQUID PROPELLANTS

COMBUSTION INSTABILITY PHENOMENA OF  
IMPORTANCE TO LIQUID PROPELLANT  
ENGINES.  
AD-A284 780

\*LIQUIDS

HIGH TEMPERATURE STABILITY OF BINARY  
MICROSTRUCTURES DERIVED FROM LIQUID  
PRECURSORS.  
AD-A283 960

\*LIVER

HEPATIC TOXICITY OF  
PERFLUOROCARBOXYLIC ACIDS.  
AD-A281 310  
IN VITRO SYSTEM FOR STUDYING  
METABOLISM OF ENVIRONMENTAL CHEMICALS  
IN HUMAN CELLS.  
AD-A284 174

\*LOW TEMPERATURE

NUMERICAL STUDIES OF LOW TEMPERATURE

UNCLASSIFIED  
SUBJECT INDEX

GALLIUM ARSENIDE BUFFER LAYERS AND THEIR INFLUENCE ON DEVICE OPERATION.  
AD-A281 156

LOW TEMPERATURE GROWN AND HIGHLY NON-STOICHIOMETRIC GAAS AND RELATED MATERIALS.  
AD-A284 898

\*LUBRICANTS  
MATERIALS DEGRADATION AND FATIGUE UNDER EXTREME CONDITIONS.  
AD-A282 969

\*MACROMOLECULES  
MULTI-FUNCTIONAL PI-CONJUGATED MACROMOLECULES BASED ON POLY(PHENYLENE VINYLENE).  
AD-A284 163

\*MAGNESIUM  
BORON ATOM MATRIX CHEMISTRY.  
AD-A282 840

PHOTODISSOCIATION SPECTROSCOPY OF MG+-RARE GAS COMPLEXES,  
AD-A283 194

\*MAGNETIC RESONANCE  
RESEARCH TRAINING OF THE EFFECTS OF TOXIC SUBSTANCES ON THE LUNGS. (FY91 AASERT).  
AD-A284 165

CUMULATIVE EFFECTS OF REPEATED BRIEF CEREBRAL ISCHEMIA.  
AD-A284 234

\*MAGNETOOPTICS  
MAGNETO-OPTICAL PROPERTIES OF QUANTUM STRUCTURES WITH REDUCED DIMENSIONALITY.  
AD-A282 597

\*MARKOV PROCESSES  
FINITE MARKOV CHAINS AND RANDOM DISCRETE STRUCTURES.  
AD-A284 192

\*MASS SPECTRA  
MECHANISTIC MODELS OF SOOT FORMATION.  
AD-A284 257

\*MATHEMATICAL ANALYSIS  
GEOMETRICAL AND TOPOLOGICAL METHODS IN TIME DOMAIN ANTENNA SYNTHESIS.  
AD-A284 208

\*MATHEMATICAL PROGRAMMING  
POLYHEDRAL APPROACHES FOR SOLVING 0-1 POLYNOMIAL PROGRAMMING PROBLEMS.  
AD-A282 448

\*MATRIX MATERIALS  
BORON ATOM MATRIX CHEMISTRY.  
AD-A282 840

\*MEASUREMENT  
SPATIALLY RESOLVED MEASUREMENTS OF SOOT VOLUME FRACTION USING LASER-INDUCED INCANDESCENCE.  
AD-A282 562

\*MECHANICAL PROPERTIES  
PROCESSING AND CHARACTERIZATION OF MECHANICALLY ALLOYED NIAL-BASED ALLOYS.  
AD-A283 959

\*MECHANICS  
INTERFACE MECHANICS OF PARTICULATE MEDIA WITH RIBBED INCLUSIONS.  
AD-A283 957

\*MEMORY DEVICES  
CEREBELLAR CIRCUIT MECHANISMS WHICH ACCOMPANY COORDINATED LIMB TRAJECTORY PATTERNS IN THE RAT: USE OF A MODEL OF SPONTANEOUS CHANGES IN LIMB COORDINATION.  
AD-A284 023

SUPERCONDUCTOR MAGNETIC MEMORY'.  
AD-B189 498L

\*MEMORY (PSYCHOLOGY)  
A PARALLEL PROCESSING HYPOTHESIS FOR SHORT-TERM AND LONG-TERM MEMORY IN APLYSIA.  
AD-A284 101

COMPARING PERFORMANCE ON IMPLICIT MEMORY TESTS.

AD-A284 861

\*MENTAL ABILITY  
PROCESSES INVOLVED IN THE INTEGRATION OF PICTURES AND DISCOURSE.  
AD-A282 942

\*METABOLISM  
HEPATIC TOXICITY OF PERFLUOROCARBOXYLIC ACIDS.  
AD-A281 310

IN VITRO SYSTEM FOR STUDYING METABOLISM OF ENVIRONMENTAL CHEMICALS IN HUMAN CELLS.  
AD-A284 174

\*METAL COMPLEXES  
PHOTOGENERATION AND CHARACTERIZATION OF ENERGETIC MOLECULES IN SUPERSONIC MOLECULAR BEAMS.  
AD-A284 108

\*METAL MATRIX COMPOSITES  
CLUSTER IONS.  
AD-A282 615

HIGH TEMPERATURE FRACTURE MECHANISMS IN METALLIC MATRIX COMPOSITES PRODUCED BY SOLIDIFICATION TECHNIQUES.  
AD-A284 169

\*METALS  
BIOTRANSFORMATION OF TOXIC METALS BY BACTERIA.  
AD-A280 893

HYDROLYSIS AND CONDENSATION OF TIN (IV) ALKOXIDE COMPOUNDS: THE CONTROL OF STRUCTURAL EVOLUTION.  
AD-A282 789

\*METASTABLE STATE  
SPECTROSCOPY OF METASTABLE SPECIES IN A FREE-JET EXPANSION: THE D' TO A' (REVERSE) TRANSITION OF IBR.  
AD-A282 563

\*MICROORGANISMS  
GEOCHEMICAL, GENETIC AND PHYSIOLOGICAL CONTROL OF POLLUTANT BIODEGRADATION.

UNCLASSIFIED  
SUBJECT INDEX

AD-A280 931

\*MICROPROCESSORS  
MICROCOMPUTER-BASED AIRCRAFT ROUTING  
AND SCHEDULING. PHASE 2.  
AD-A282 930

\*MICROSCOPY  
TIME-RESOLVED, HIGH-RESOLUTION, X-RAY  
MICROSCOPY OF IN-VITRO BIOLOGICAL AND  
LIFE SCIENCE SPECIMENS WITH THE AID  
OF LASER PLASMAS.  
AD-A283 200

\*MICROSTRUCTURE  
COMPUTATIONAL METHODS FOR  
MICROSTRUCTURE COVOLUME TECHNIQUES OF  
DISCRETIZATION.  
AD-A282 449

HIGH TEMPERATURE STABILITY OF BINARY  
MICROSTRUCTURES DERIVED FROM LIQUID  
PRECURSORS.  
AD-A283 960

\*MILITARY AIRCRAFT  
MICROCOMPUTER-BASED AIRCRAFT ROUTING  
AND SCHEDULING. PHASE 2.  
AD-A282 930

\*MILITARY ENGINEERING  
AIR FORCE ENGINEERING RESEARCH  
INITIATION GRANT PROGRAM.  
AD-A284 028

\*MODELS  
MECHANISTIC MODELS OF SOOT FORMATION.  
AD-A284 257

\*MODULUS OF ELASTICITY  
ELECTRIC FIELD DEPENDENCE OF YOUNG'S  
MODULUS OF (TMTSF)2PF6,  
AD-A281 324

\*MOLECULAR COMPLEXES  
PHOTOGENERATION AND CHARACTERIZATION  
OF ENERGETIC MOLECULES IN SUPERSONIC  
MOLECULAR BEAMS.  
AD-A284 108

\*MOLECULAR IONS  
RESONANT CHARGE TRANSFER IN  
HYPERTHERMAL ATOMIC AND MOLECULAR ION-  
SURFACE COLLISIONS.  
AD-A281 369

\*MOLECULAR PROPERTIES  
ADVANCED CRYOGENIC PROPELLANTS.  
AD-A282 451  
THE ROLE OF EXCITED MOLECULAR IODINE  
IN THE CHEMICAL OXYGEN IODINE LASER,  
AD-A282 735

\*MOLECULAR SPECTROSCOPY  
FUNDAMENTAL STUDIES OF A HIGH ENERGY  
MOLECULAR SYSTEM: SPECTROSCOPY OF  
BORON IN HYDROGEN CLUSTERS. ASSERT-92.  
AD-A283 181

\*MOLECULE MOLECULE INTERACTIONS  
INTEGRAL EQUATION STUDY OF  
MICROSTRUCTURE AND SOLVATION IN MODEL  
ATTRACTIVE AND REPULSIVE  
SUPERCRITICAL MIXTURES.  
AD-A284 185

\*MOTION  
VISUAL PSYCHOPHYSICS OF EGOMOTION.  
AD-A282 547  
VISUAL MOTION PERCEPTION AND VISUAL  
INFORMATION PROCESSING.  
AD-A282 928

LARGE AMPLITUDE MOTIONS, ESPECIALLY  
ISOMERIZATION AND TUNNELING IN  
POLYATOMIC MOLECULE SPECTRA: NOVEL  
EXPERIMENTAL, PATTERN RECOGNITION,  
AND THEORETICAL METHODS.  
AD-A284 194

\*MOTOR NEURONS  
BIOLOGICAL AND THEORETICAL STUDIES OF  
ADAPTIVE NETWORKS: THE CONDITIONED  
RESPONSE.  
AD-A284 781

\*MULTICHANNEL  
SIGNET-SOFTWARE TOOLS FOR SIGNAL  
IDENTIFICATION USING NEURAL NETWORKS.  
AD-A284 362

\*NAPHTHALENES  
RESEARCH TRAINING FOR UNDERSTANDING  
THE FATE OF ENVIRONMENTAL POLLUTANTS.  
(FY91 AASERT).  
AD-A284 164

\*NEAR INFRARED RADIATION  
NEAR-INFRARED TO BLUE ENERGY  
UPCONVERSION IN LAF(3):HO3+.  
AD-A282 785

\*NEOPLASMS  
THE ROLE OF CHEMICAL INHIBITION OF  
GAP JUNCTIONAL INTERCELLULAR  
COMMUNICATION IN TOXICOLOGY.  
AD-A282 452

\*NERVE CELLS  
LOCUS COERULEUS, VIGILANCE AND STRESS:  
BRAIN MECHANISMS OF ADAPTIVE  
BEHAVIORAL RESPONSIVENESS.  
AD-A282 450  
CEREBELLAR CIRCUIT MECHANISMS WHICH  
ACCOMPANY COORDINATED LIMB TRAJECTORY  
PATTERNS IN THE RAT: USE OF A MODEL  
OF SPONTANEOUS CHANGES IN LIMB  
COORDINATION.  
AD-A284 023

EXTRATHALAMIC MODULATION OF CORTICAL  
RESPONSIVENESS.  
AD-A284 100

CELLULAR NEUROPHYSIOLOGY OF THE RAT  
SUPRACHIASMATIC NUCLEUS: ELECTRICAL  
PROPERTIES, NEUROTRANSMISSION, AND  
MECHANISMS OF SYNCHRONIZATION.  
AD-A284 111  
CELLULAR ANALYSIS OF CIRCADIAN  
RHYTHMICITY IN CULTURED SCN NEURONS.  
AD-A284 167

\*NEURAL NETS  
LOCUS COERULEUS, VIGILANCE AND STRESS:  
BRAIN MECHANISMS OF ADAPTIVE  
BEHAVIORAL RESPONSIVENESS.  
AD-A282 450  
PHASE AND AMPLITUDE CONTROLLED  
MICROPATCH ANTENNA.  
AD-A284 191

UNCLASSIFIED  
SUBJECT INDEX

SIGNET-SOFTWARE TOOLS FOR SIGNAL  
IDENTIFICATION USING NEURAL NETWORKS.  
AD-A284 362

BIOLOGICAL AND THEORETICAL STUDIES OF  
ADAPTIVE NETWORKS: THE CONDITIONED  
RESPONSE.  
AD-A284 781

\*NEUROBIOLOGY  
COMPUTATIONAL VISION BASED ON  
NEUROBIOLOGY.  
AD-A284 472

\*NEUROPHYSIOLOGY  
NEUROPHYSIOLOGICAL ANALYSIS OF  
CIRCADIAN RHYTHM ENTRAINMENT.  
AD-A280 981  
A PARALLEL PROCESSING HYPOTHESIS FOR  
SHORT-TERM AND LONG-TERM MEMORY IN  
APLYSIA.  
AD-A284 101

\*NICKEL ALLOYS  
CORNELL PROGRAM FOR THE DESIGN AND  
SYNTHESIS OF ADVANCED MATERIALS.  
AD-A281 352  
PROCESSING AND CHARACTERIZATION OF  
MECHANICALLY ALLOYED NIAL-BASED  
ALLOYS.  
AD-A283 959

\*NITRO RADICALS  
PARAMAGNETIC INTERACTIONS OF TRIPLET  
RADICAL PAIRS WITH NITROXIDE RADICALS:  
AN 'ANTISCVENGING' EFFECT.  
AD-A282 855

\*NITROGEN  
VIBRATIONAL SPECIFICITY FOR CHARGE  
TRANSFER VERSUS DEACTIVATION IN N<sub>2</sub><sup>+</sup>(V  
= 0,1,2) + AR AND O<sub>2</sub> REACTIONS,  
AD-A284 200

\*NITROGEN OXIDES  
GAS-SURFACE INTERACTIONS NEAR  
DISSOCIATION THRESHOLD.  
AD-A282 726

\*NONEQUILIBRIUM FLOW

HYPERVELOCITY AIR FLOWS WITH FINITE  
RATE CHEMISTRY.  
AD-A284 727

\*NONLINEAR ANALYSIS  
STOCHASTIC CONTROL AND NONLINEAR  
ESTIMATION.  
AD-A281 219

\*NONLINEAR OPTICS  
NONLINEAR OPTICAL AND CHARGE  
DISTRIBUTION STUDIES PROBING ELECTRIC  
FIELD EFFECTS IN POLYMER THIN FILMS  
FOR SECOND ORDER NONLINEAR OPTICS.  
AD-A280 980  
RATIONAL DESIGN, CONSTRUCTION, AND  
PROCESSING OF HIGH-PERFORMANCE  
NONLINEAR, OPTICAL MATERIALS.  
AD-A281 283  
MATERIALS FOR SECOND AND THIRD ORDER  
NONLINEAR OPTICAL APPLICATIONS.  
AD-A281 304

STUDIES OF OPTICAL PHASE CONJUGATORS  
AND APPLICATIONS.  
AD-A282 626  
NEW MECHANISMS AND NEW MATERIALS FOR  
ORGANIC OPTICAL NONLINEARITY.  
AD-A282 781  
CONJUGATED POLYMERS WITH DEGENERATE  
GROUND STATE: THE ROUTE TO HIGH  
PERFORMANCE NLO RESPONSE. (F91  
ASSERT).

AD-A283 958  
SINGLE CRYSTAL FILMS AND WAVEGUIDES  
OF ORGANIC MATERIALS: PREPARATION AND  
NONLINEAR OPTICAL PROPERTIES.  
AD-A284 471  
ENHANCED QUANTUM DOT NONLINEAR  
OPTICALS MATERIALS.  
AD-B187 187

\*NOREPINEPHRINE  
MEASUREMENT AND REGULATION OF CENTRAL  
NORADRENERGIC RECEPTORS.  
AD-A284 219

\*NUCLEAR PARTICLES  
ATOMIC PROCESSES RELEVANT TO  
ANTIMATTER FUEL PRODUCTION AND

STORAGE.  
AD-A280 938

\*NUCLEAR SPINS  
COUPLED-CLUSTER CALCULATIONS OF  
INDIRECT NUCLEAR COUPLING CONSTANTS:  
THE IMPORTANCE OF NON-FERMI CONTACT  
CONTRIBUTIONS.  
AD-A284 130

\*NUCLEI  
NEUROPHYSIOLOGICAL ANALYSIS OF  
CIRCADIAN RHYTHM ENTRAINMENT.  
AD-A280 981  
CELLULAR ANALYSIS OF CIRCADIAN  
RHYTHMICITY IN CULTURED SCN NEURONS.  
AD-A284 167

\*NUCLEI(BIOLOGY)  
EXTRATHALAMIC MODULATION OF CORTICAL  
RESPONSIVENESS.  
AD-A284 100

\*NUMERICAL METHODS AND PROCEDURES  
NUMERICAL STUDIES OF LOW TEMPERATURE  
GALLIUM ARSENIDE BUFFER LAYERS AND  
THEIR INFLUENCE ON DEVICE OPERATION.  
AD-A281 156

\*OLIGOMERS  
AASERT 92 - SYNTHESIS AND PROPERTIES  
OF COMPLEX POLYARYLENE VINYLENES.  
AD-A284 215

\*OPERATORS(PERSONNEL)  
SITUATIONAL AWARENESS IN COMPLEX  
SYSTEMS.  
AD-A281 448

\*OPTICAL ANALYSIS  
STUDIES OF OPTICAL PHASE CONJUGATORS  
AND APPLICATIONS.  
AD-A282 626

\*OPTICAL COMMUNICATIONS  
PHOTONIC COMPUTER LINKS USING MULTI-  
CHANNEL VERTICAL-CAVITY SURFACE-  
EMITTING LASER ARRAYS.  
AD-B186 566L



UNCLASSIFIED  
SUBJECT INDEX

- AD-A282 649
- \*OPTICAL IMAGES  
LOCAL SPATIO-TEMPORAL ANALYSIS IN  
VISION SYSTEMS.  
AD-A284 162
- \*OPTICAL MATERIALS  
RATIONAL DESIGN, CONSTRUCTION, AND  
PROCESSING OF HIGH-PERFORMANCE  
NONLINEAR, OPTICAL MATERIALS.  
AD-A281 283
- MATERIALS FOR SECOND AND THIRD ORDER  
NONLINEAR OPTICAL APPLICATIONS.  
AD-A281 304
- SYSTEMATIC OPTIMIZATION OF SECOND  
ORDER NONLINEAR OPTICAL MATERIALS.  
AD-A281 350
- NEW MECHANISMS AND NEW MATERIALS FOR  
ORGANIC OPTICAL NONLINEARITY.  
AD-A282 781
- INTERNATIONAL COLLABORATION PROGRAM  
IN INNOVATIVE CHEMICAL PROCESSING OF  
SUPERIOR ELECTRONIC AND OPTICAL  
MATERIALS.  
AD-A282 946
- ENHANCED QUANTUM DOT NONLINEAR  
OPTICALS MATERIALS.  
AD-B187 187
- \*OPTICAL PROPERTIES  
SINGLE CRYSTAL FILMS AND WAVEGUIDES  
OF ORGANIC MATERIALS: PREPARATION AND  
NONLINEAR OPTICAL PROPERTIES.  
AD-A284 471
- LOW TEMPERATURE GROWN AND HIGHLY NON-  
STOICHIOMETRIC GAAS AND RELATED  
MATERIALS.  
AD-A284 898
- \*OPTICAL SWITCHING  
WAVELENGTH-ENCODED PROCESSING IN  
SEMICONDUCTOR LASERS.  
AD-A282 649
- POLYMER FIBERS FOR NONLINEAR OPTICS.  
AD-A284 216
- \*OPTICAL WAVEGUIDES  
WAVELENGTH-ENCODED PROCESSING IN  
SEMICONDUCTOR LASERS.
- \*ORGANIC COMPOUNDS  
THE SYNTHESIS AND CHARACTERIZATION OF  
RADICAL CATION SALTS OF  
BIS(ETHYLENEDITHIO)  
TETRASELENAFULVALENE,  
AD-A281 118
- \*ORGANIC MATERIALS  
AC CALORIMETRY AT CDW AND SDW  
TRANSITIONS,  
AD-A281 117
- FABRICATION OF BIOMIMETIC MOLECULAR  
LEVEL COMPOSITES.  
AD-A284 204
- \*OXIDATION REDUCTION REACTIONS  
SPECTROELECTROCHEMICAL INVESTIGATIONS  
OF MOLTEN HALIDE SOLUTIONS.  
AD-A284 147
- \*OXIDES  
THERMODYNAMICS OF THE ANION ORDERING  
TRANSITIONS IN (TMTSF)2RbO4 AND  
(TMTSF)2BF4,  
AD-A281 119
- PROPERTY CONTROL OF (PERFLUORINATED  
IONOMER)/(INORGANIC OXIDE) COMPOSITES  
BY TAILORING THE NANOSCALE MORPHOLOGY.  
AD-A281 370
- LASER SPECTROSCOPY OF UO:  
CHARACTERIZATION AND ASSIGNMENT OF  
STATES IN THE 0- TO 3-EV RANGE, WITH  
A COMPARISON TO THE ELECTRONIC  
STRUCTURE OF ThO.  
AD-A282 546
- LASER SPECTROSCOPY OF GdO: LIGAND  
FIELD ASSIGNMENTS OF 4F7(8S)6P  
REVERSING 4F7(8)6S TRANSITIONS,  
AD-A282 827
- PARAMAGNETIC INTERACTIONS OF TRIPLET  
RADIAL PAIRS WITH NITROXIDE RADICALS:  
AN 'ANTISCRAVENGING' EFFECT.  
AD-A282 855
- \*OXYGEN  
VIBRATIONAL SPECIFICITY FOR CHARGE  
TRANSFER VERSUS DEACTIVATION IN N2+(V
- = 0, 1, 2) + AR AND O2 REACTIONS,  
AD-A284 200
- \*PACEMAKERS  
CELL CULTURE AND TRANSPLANTATION OF  
THE SUPRACHIASMATIC CIRCADIAN  
PACEMAKER.  
AD-A280 977
- \*PARAMAGNETISM  
PARAMAGNETIC INTERACTIONS OF TRIPLET  
RADIAL PAIRS WITH NITROXIDE RADICALS:  
AN 'ANTISCRAVENGING' EFFECT.  
AD-A282 855
- \*PARTIAL DIFFERENTIAL EQUATIONS  
RECONSTRUCTION OF SHAPES FROM SHADING  
AND SHAPE BASED IMAGE RECONSTRUCTION  
USING MODERN NONLINEAR ANALYSIS.  
AD-A284 107
- \*PARTICLE TRAJECTORIES  
MEASUREMENTS AND SIMULATIONS OF  
PARTICLE DISPERSION IN A TURBULENT  
FLOW,  
AD-A280 973
- \*PARTICLES  
SUPERCRITICAL FLUIDS IN PARTICLE  
FORMATION MEDIA,  
AD-A284 217
- \*PARTICULATES  
INTERFACE MECHANICS OF PARTICULATE  
MEDIA WITH RIBBED INCLUSIONS.  
AD-A283 957
- \*PATTERN RECOGNITION  
PRESENTATIONS OF SHAPE IN OBJECT  
RECOGNITION AND LONG-TERM VISUAL  
MEMORY.  
AD-A281 336
- VISUAL MOTION PERCEPTION AND VISUAL  
INFORMATION PROCESSING.  
AD-A282 928
- \*PERFORMANCE TESTS  
COMPARING PERFORMANCE ON IMPLICIT  
MEMORY TESTS.

UNCLASSIFIED  
SUBJECT INDEX

AD-A284 861  
\*PERIODICALS  
LOW TEMPERATURE GROWN AND HIGHLY NON-  
STOICHIOMETRIC GAAS AND RELATED  
MATERIALS.  
AD-A284 898

\*PHASE  
DIFFUSION OF HYDROGEN ATOMS ON A  
SI(111)-(7X7) RECONSTRUCTED SURFACE:  
MONTE CARLO VARIATIONAL PHASE-SPACE  
THEORY.  
AD-A284 205

\*PHASED ARRAYS  
PHASE AND AMPLITUDE CONTROLLED  
MICROPATCH ANTENNA.  
AD-A284 191

\*PHENANTHRENES  
RESEARCH TRAINING FOR UNDERSTANDING  
THE FATE OF ENVIRONMENTAL POLLUTANTS.  
(FY91 AASERT).  
AD-A284 164

\*PHOSPHOLIPIDS  
ELECTRON TRANSPORT REACTIONS BETWEEN  
PYRENE AND METHYLVIOLIGEN IN A MODEL  
BIOLOGICAL MEMBRANE.  
AD-A283 184

\*PHOSPHORUS  
SAM1 SEMIEMPIRICAL PARAMETERS.  
AD-A284 400

\*PHOTOCHEMICAL REACTIONS  
ASSERT-92: A NOVEL PHOTOCHEMICAL AND  
INTERFACIAL APPROACH TO THE  
DEGRADATION OF HAZARDOUS MATERIALS.  
AD-A282 618  
ELECTROCHEMICAL AND SPECTROSCOPY  
STUDIES OF SELECTED INORGANIC AND  
ORGANIC SYSTEMS IN MOLTEN HALIDES.  
AD-A284 171

\*PLANAR STRUCTURES  
A FULL-DIMENSIONAL SEMICLASSICAL  
CALCULATION OF VIBRATIONAL MODE

SELECTIVITY IN THE TUNNELING  
SPLITTING IN A PLANAR MODEL OF  
MALONALDEHYDE.  
AD-A284 772

\*PLASMA ACCELERATORS  
ANALYSIS OF CONSTANT VELOCITY PULSED  
PLASMA ACCELERATOR,  
AD-B188 916

\*POLYATOMIC MOLECULES  
LARGE AMPLITUDE MOTIONS, ESPECIALLY  
ISOMERIZATION AND TUNNELING IN  
POLYATOMIC MOLECULE SPECTRA: NOVEL  
EXPERIMENTAL, PATTERN RECOGNITION,  
AND THEORETICAL METHODS.  
AD-A284 194

\*POLYMERS  
NONLINEAR OPTICAL AND CHARGE  
DISTRIBUTION STUDIES PROBING ELECTRIC  
FIELD EFFECTS IN POLYMER THIN FILMS  
FOR SECOND ORDER NONLINEAR OPTICS.  
AD-A280 980  
DESIGN STRATEGIES FOR THE PREPARATION  
OF POLYMERIC ORGANIC SUPERCONDUCTORS.  
AD-A281 306  
SYSTEMATIC OPTIMIZATION OF SECOND  
ORDER NONLINEAR OPTICAL MATERIALS.  
AD-A281 350  
POLYMER-POLYMER INTERACTIONS.  
AD-A282 944  
THERMAL RELAXATION PROCESSES AND  
STABILITY IN POLED ELECTRO-OPTIC  
POLYMERS.  
AD-A283 948  
CONJUGATED POLYMERS WITH DEGENERATE  
GROUND STATE: THE ROUTE TO HIGH  
PERFORMANCE NLO RESPONSE. (F91  
ASSERT).  
AD-A283 958  
ELEMENTAL FLUORINE BASED SYNTHESIS OF  
PENTAFLUORO PHENYL AND OTHER AROMATIC  
PERFLUOROPOLYETHER POLYMERS.  
AD-A284 102  
PRECIPITATION OF POLY(L-LACTIC ACID)  
AND COMPOSITE POLY(L-LACTIC ACID)-  
PYRENE PARTICLES BY RAPID EXPANSION  
OF SUPERCRITICAL SOLUTIONS,

AD-A284 199

\*POLYNOMIALS  
POLYHEDRAL APPROACHES FOR SOLVING 0-1  
POLYNOMIAL PROGRAMMING PROBLEMS.  
AD-A282 448

\*POWDERS  
PROCESSING AND CHARACTERIZATION OF  
MECHANICALLY ALLOYED NIAL-BASED  
ALLOYS.  
AD-A283 959

\*PRECIPITATION  
PRECIPITATION OF POLY(L-LACTIC ACID)  
AND COMPOSITE POLY(L-LACTIC ACID)-  
PYRENE PARTICLES BY RAPID EXPANSION  
OF SUPERCRITICAL SOLUTIONS.  
AD-A284 199

\*PRECURSORS  
HIGH TEMPERATURE STABILITY OF BINARY  
MICROSTRUCTURES DERIVED FROM LIQUID  
PRECURSORS.  
AD-A283 960

\*PROCESSING  
ATOMIC PROCESSES RELEVANT TO  
ANTIMATTER FUEL PRODUCTION AND  
STORAGE.  
AD-A280 938

\*PRODUCTION  
ATOMIC PROCESSES RELEVANT TO  
ANTIMATTER FUEL PRODUCTION AND  
STORAGE.  
AD-A280 938

\*PROPELLANTS  
ADVANCED CRYOGENIC PROPELLANTS.  
AD-A282 451

\*PROTONS  
A FULL-DIMENSIONAL SEMICLASSICAL  
CALCULATION OF VIBRATIONAL MODE  
SELECTIVITY IN THE TUNNELING  
SPLITTING IN A PLANAR MODEL OF  
MALONALDEHYDE.  
AD-A284 772

UNCLASSIFIED  
SUBJECT INDEX

- \*PSYCHOLOGY  
INTERDISCIPLINARY TRAINING IN LIFE  
SCIENCES (FY91 ASSERT).  
AD-A282 938
- \*PSYCHOMOTOR TESTS  
SITUATIONAL AWARENESS IN COMPLEX  
SYSTEMS.  
AD-A281 448
- \*PULSED LASERS  
LASER-INITIATED CONICAL DETONATION  
WAVE FOR SUPERSONIC COMBUSTION. 2.  
AD-A280 985
- \*PYROLYSIS  
MECHANISTIC MODELS OF SOOT FORMATION.  
AD-A284 257
- \*QUANTUM ELECTRONICS  
LARGE SIGNAL TIME DEPENDENT QUANTUM  
MECHANICAL TRANSPORT IN QUANTUM PHASE  
BASED DEVICES.  
AD-A283 338
- \*QUANTUM THEORY  
ACCURATE ELECTRON AFFINITIES OF SMALL  
CARBON CLUSTERS.  
AD-A284 434
- \*QUANTUM WELLS  
MAGNETO-OPTICAL PROPERTIES OF QUANTUM  
STRUCTURES WITH REDUCED  
DIMENSIONALITY.  
AD-A282 597
- QUANTUM WELL AND SUPERLATTICE IR  
DETECTOR DEVELOPMENT. PHASE 1.  
AD-B187 142
- \*RARE EARTH ELEMENTS  
LASER SPECTROSCOPY OF GDO: LIGAND  
FIELD ASSIGNMENTS OF 4F7(8S)6P  
REVERSING 4F7(8)6S TRANSITIONS.  
AD-A282 827
- \*RARE GASES  
ADVANCED CRYOGENIC PROPELLANTS.  
AD-A282 451
- PHOTODISSOCIATION SPECTROSCOPY OF MG+  
-RARE GAS COMPLEXES.  
AD-A283 194
- \*REACTIVITIES  
REACTIONS OF ATMOSPHERIC CLUSTER IONS.  
AD-A282 598
- \*RECOMBINATION REACTIONS  
ATOMIC PROCESSES RELEVANT TO  
ANTIMATTER FUEL PRODUCTION AND  
STORAGE.  
AD-A280 938
- PARAMAGNETIC INTERACTIONS OF TRIPLET  
RADIAL PAIRS WITH NITROXIDE RADICALS:  
AN 'ANTISCVENGING' EFFECT.  
AD-A282 855
- \*REFRACTORY METALS  
AASERT-93: ELECTROPLATING OF  
REFRACTORY METALS USING HALOALUMINATE  
MELTS.  
AD-A284 859
- \*RELATIVISTIC ELECTRONS  
RELATIVISTIC EFFECTS AT THE  
CORRELATED LEVEL. AN APPLICATION TO  
INTERHALOGENS.  
AD-A284 145
- \*RELAXATION TIME  
THERMAL RELAXATION PROCESSES AND  
STABILITY IN POLED ELECTRO-OPTIC  
POLYMERS.  
AD-A283 948
- \*RESEARCH MANAGEMENT  
AIR FORCE OFFICE OF SCIENTIFIC  
RESEARCH. RESEARCH PROPOSAL,  
QUARTERLY STATUS REPORT OCTOBER-  
DECEMBER 1993.  
AD-A282 939
- \*RESOLUTION  
SPATIALLY RESOLVED MEASUREMENTS OF  
SOOT VOLUME FRACTION USING LASER-  
INDUCED INCANDESCENCE.  
AD-A282 562
- \*RESONANCE  
RESONANT CHARGE TRANSFER IN  
HYPERTHERMAL ATOMIC AND MOLECULAR ION-  
SURFACE COLLISIONS.  
AD-A281 369
- \*RETINA  
ULTRASHORT LASER PULSE EFFECTS IN  
OCULAR AND RELATED MEDIA: LASER-  
INDUCED SHOCK WAVE PROPAGATION AND  
RETINAL DAMAGE.  
AD-A282 599
- ALDEHYDIC PRODUCTS OF LIPID  
PEROXIDATION IN THE RETINA GENERATED  
BY ENVIRONMENTAL TOXINS.  
AD-A284 172
- \*RHENIUM  
THERMODYNAMICS OF THE ANION ORDERING  
TRANSITIONS IN (TMTSF)2REO4 AND  
(TMTSF)2BF4.  
AD-A281 119
- \*ROBOTICS  
STRUCTURAL INTEGRITY OF INTELLIGENT  
MATERIALS AND STRUCTURES.  
AD-A280 941
- \*ROCKET ENGINES  
MEASUREMENTS OF DROPLET DISPERSION IN  
HEATED AND UNHEATED TURBULENT JETS.  
AD-A284 252
- \*ROUTING  
MICROCOMPUTER-BASED AIRCRAFT ROUTING  
AND SCHEDULING. PHASE 2.  
AD-A282 930
- \*SALTS  
THE SYNTHESIS AND CHARACTERIZATION OF  
RADICAL CATION SALTS OF  
BIS(ETHYLENEDITHIO)  
TETRASELENAFULVALENE,  
AD-A281 118
- \*SCHEDULING  
MICROCOMPUTER-BASED AIRCRAFT ROUTING  
AND SCHEDULING. PHASE 2.  
AD-A282 930



UNCLASSIFIED  
SUBJECT INDEX

- \*SEISMOGRAPHS  
  AASERT-92 OBSERVATIONAL ANALYSIS OF  
  THE ORIGIN OF NON-DOUBLE COUPLE  
  SEISMIC SOURCES.  
  AD-A281 158
- \*SEMICONDUCTOR LASERS  
  WAVELENGTH-ENCODED PROCESSING IN  
  SEMICONDUCTOR LASERS.  
  AD-A282 649
- \*SEMICONDUCTORS  
  MAGNETO-OPTICAL PROPERTIES OF QUANTUM  
  STRUCTURES WITH REDUCED  
  DIMENSIONALITY.  
  AD-A282 597
- \*SHOCK TUNNELS  
  HYPERVELOCITY FLOW SIMULATION,  
  AD-A284 197
- \*SHOCK WAVES  
  MATHEMATICAL PROBLEMS OF NONLINEAR  
  WAVE PROPAGATION AND OF WAVES IN  
  HETEROGENEOUS MEDIA.  
  AD-A282 217
- \*SHORT WAVELENGTHS  
  NCL(B) BASED SHORT WAVELENGTH  
  CHEMICAL LASER.  
  AD-A284 213
- \*SIGNAL PROCESSING  
  A NEW MULTI-DIMENSIONAL TRANSFORM FOR  
  DIGITAL SIGNAL PROCESSING USING  
  GENERALIZED ASSOCIATION SCHEMES.  
  AD-A284 166
- SIGNET-SOFTWARE TOOLS FOR SIGNAL  
  IDENTIFICATION USING NEURAL NETWORKS.  
  AD-A284 362
- \*SILICA GLASS  
  MATERIALS DEGRADATION AND FATIGUE  
  UNDER EXTREME CONDITIONS.  
  AD-A282 969
- \*SILICON  
  FIRST-PRINCIPLES-DERIVED RATE
- CONSTANTS FOR H ADATOM SURFACE  
DIFFUSION ON SI(100)-2X1,  
AD-A284 143
- DIFFUSION OF HYDROGEN ATOMS ON A  
SI(111)-(7X7) RECONSTRUCTED SURFACE:  
MONTE CARLO VARIATIONAL PHASE-SPACE  
THEORY.  
AD-A284 205
- \*SINGLE CRYSTALS  
  SINGLE CRYSTAL FILMS AND WAVEGUIDES  
  OF ORGANIC MATERIALS: PREPARATION AND  
  NONLINEAR OPTICAL PROPERTIES.  
  AD-A284 471
- \*SKILLS  
  SITUATIONAL AWARENESS IN COMPLEX  
  SYSTEMS.  
  AD-A281 448
- \*SLEEP  
  PHASE-SHIFTING EFFECTS OF LIGHT AND  
  ACTIVITY ON THE HUMAN CIRCADIAN CLOCK.  
  AD-A281 204
- \*SOFTWARE ENGINEERING  
  SIGNET-SOFTWARE TOOLS FOR SIGNAL  
  IDENTIFICATION USING NEURAL NETWORKS.  
  AD-A284 362
- \*SOLAR SYSTEM  
  FUNDAMENTALS OF ASTRODYNAMICS.  
  AD-B189 080
- \*SOLIDS  
  ADVANCED CRYOGENIC PROPELLANTS.  
  AD-A282 451
- SUPERCRITICAL FLUIDS IN PARTICLE  
  FORMATION MEDIA,  
  AD-A284 217
- \*SOLUTES  
  SOLUTE-SOLUTE INTERACTIONS: THEORY  
  AND SIMULATIONS,  
  AD-A284 226
- \*SOLVATION  
  INTEGRAL EQUATION STUDY OF  
  MICROSTRUCTURE AND SOLVATION IN MODEL
- ATTRACTIVE AND REPULSIVE  
SUPERCRITICAL MIXTURES.  
AD-A284 185
- \*SOOT  
  SPATIALLY RESOLVED MEASUREMENTS OF  
  SOOT VOLUME FRACTION USING LASER-  
  INDUCED INCANDESCENCE.  
  AD-A282 562
- SURFACE REACTIVITY OF COMBUSTION  
  GENERATED SOOT PARTICLES.  
  AD-A284 092
- MECHANISTIC MODELS OF SOOT FORMATION.  
  AD-A284 257
- \*SOUND PITCH  
  PERCEPTION OF COMPLEX AUDITORY  
  PATTERNS.  
  AD-A284 189
- \*SPACE PROPULSION  
  ANALYSIS OF CONSTANT VELOCITY PULSED  
  PLASMA ACCELERATOR,  
  AD-B188 916
- \*SPATIAL DISTRIBUTION  
  SPATIALLY RESOLVED MEASUREMENTS OF  
  SOOT VOLUME FRACTION USING LASER-  
  INDUCED INCANDESCENCE.  
  AD-A282 562
- \*SPECIFIC HEAT  
  AC CALORIMETRY AT CDW AND SDW  
  TRANSITIONS.  
  AD-A281 117
- \*SPECTRA  
  LARGE AMPLITUDE MOTIONS, ESPECIALLY  
  ISOMERIZATION AND TUNNELING IN  
  POLYATOMIC MOLECULE SPECTRA: NOVEL  
  EXPERIMENTAL, PATTERN RECOGNITION,  
  AND THEORETICAL METHODS.  
  AD-A284 194
- \*SPECTROSCOPY  
  LASER SPECTROSCOPY OF UO:  
  CHARACTERIZATION AND ASSIGNMENT OF  
  STATES IN THE 0- TO 3-EV RANGE, WITH  
  A COMPARISON TO THE ELECTRONIC

UNCLASSIFIED  
SUBJECT INDEX

- STRUCTURE OF THO.  
AD-A282 546  
SPECTROSCOPY OF METASTABLE SPECIES IN  
A FREE-JET EXPANSION: THE D' TO A'  
(REVERSE) TRANSITION OF IBr.  
AD-A282 563  
LASER SPECTROSCOPY OF GDO: LIGAND  
FIELD ASSIGNMENTS OF 4F7(8S)6P  
REVERSING 4F7(8)6S TRANSITIONS.  
AD-A282 827  
CUMULATIVE EFFECTS OF REPEATED BRIEF  
CEREBRAL ISCHEMIA.  
AD-A284 234
- \*SPLITTING  
A FULL-DIMENSIONAL SEMICLASSICAL  
CALCULATION OF VIBRATIONAL MODE  
SELECTIVITY IN THE TUNNELING  
SPLITTING IN A PLANAR MODEL OF  
MALONALDEHYDE,  
AD-A284 772
- \*STOCHASTIC CONTROL  
STOCHASTIC CONTROL AND NONLINEAR  
ESTIMATION.  
AD-A281 219
- \*STOICHIOMETRY  
LOW TEMPERATURE GROWN AND HIGHLY NON-  
STOICHIOMETRIC GAAS AND RELATED  
MATERIALS.  
AD-A284 898
- \*STORAGE  
ATOMIC PROCESSES RELEVANT TO  
ANTIMATTER FUEL PRODUCTION AND  
STORAGE.  
AD-A280 938
- \*STRAIN GAGES  
SHAPED STRAIN SENSORS FOR INTELLIGENT  
STRUCTURES.  
AD-A282 333
- \*STRAIN(MECHANICS)  
SHAPED STRAIN SENSORS FOR INTELLIGENT  
STRUCTURES.  
AD-A282 333
- \*STRESS(PHYSIOLOGY)  
LOCUS COERULEUS, VIGILANCE AND STRESS:  
BRAIN MECHANISMS OF ADAPTIVE  
BEHAVIORAL RESPONSIVENESS.  
AD-A282 450  
MEASUREMENT AND REGULATION OF CENTRAL  
NORADRENERGIC RECEPTORS.  
AD-A284 219
- \*STRUCTURAL RESPONSE  
STRUCTURAL INTEGRITY OF INTELLIGENT  
MATERIALS AND STRUCTURES.  
AD-A280 941
- \*STRUCTURES  
HYDROLYSIS AND CONDENSATION OF TIN  
(IV) ALKOXIDE COMPOUNDS: THE CONTROL  
OF STRUCTURAL EVOLUTION.  
AD-A282 789
- \*SULFONATES  
PROPERTY CONTROL OF (PERFLUORINATED  
IONOMER)/(INORGANIC OXIDE) COMPOSITES  
BY TAILORING THE NANOSCALE MORPHOLOGY.  
AD-A281 370
- \*SULFUR  
SAM1 SEMIEMPIRICAL PARAMETERS.  
AD-A284 400
- \*SUPERCONDUCTIVITY  
SYNTHESIS, SUPERCONDUCTIVITY, X-RAY  
STRUCTURE AND ELECTRONIC BAND  
STRUCTURE OF WAVELENGTHS-(BETS)2GACL4,  
AD-A281 224
- \*SUPERCONDUCTORS  
AC CALORIMETRY AT CDW AND SDW  
TRANSITIONS,  
AD-A281 117  
THERMODYNAMICS OF THE ANION ORDERING  
TRANSITIONS IN (TMTSF)2REO4 AND  
(TMTSF)2BF4,  
AD-A281 119  
DESIGN STRATEGIES FOR THE PREPARATION  
OF POLYMERIC ORGANIC SUPERCONDUCTORS.  
AD-A281 306  
DESIGN AND SYNTHESIS OF ORGANIC  
SUPERCONDUCTORS (FY92 URI/RIP).
- AD-A281 308  
ELECTRIC FIELD DEPENDENCE OF YOUNG'S  
MODULUS OF (TMTSF)2PF6,  
AD-A281 324
- \*SUPERCRITICAL FLOW  
PRECIPITATION OF POLY(L-LACTIC ACID)  
AND COMPOSITE POLY(L-LACTIC ACID)-  
PYRENE PARTICLES BY RAPID EXPANSION  
OF SUPERCRITICAL SOLUTIONS,  
AD-A284 199  
SUPERCRITICAL FLUIDS IN PARTICLE  
FORMATION MEDIA,  
AD-A284 217  
SOLUTE-SOLUTE INTERACTIONS: THEORY  
AND SIMULATIONS,  
AD-A284 226
- \*SUPERLATTICES  
QUANTUM WELL AND SUPERLATTICE IR  
DETECTOR DEVELOPMENT. PHASE 1.  
AD-B187 142
- \*SUPERSONIC COMBUSTION  
THEORETICAL AND EXPERIMENTAL STUDIES  
OF LASER-INITIATED DETONATION WAVES  
FOR SUPERSONIC COMBUSTION,  
AD-A280 984  
LASER-INITIATED CONICAL DETONATION  
WAVE FOR SUPERSONIC COMBUSTION. 2,  
AD-A280 985
- \*SUPERSONIC FLIGHT  
INTERACTION OF CHEMISTRY, TURBULENCE,  
AND SHOCK WAVES IN HYPERVELOCITY FLOW.  
AD-A282 941
- \*SUPERSONIC FLOW  
LASER-INITIATED CONICAL DETONATION  
WAVE FOR SUPERSONIC COMBUSTION. 2,  
AD-A280 985
- \*SURFACES  
CHEMISORPTION ENERGETICS OF  
SUPERACTIVE CHLORINE CONTAINING  
SPECIES ON GALLIUM ARSENIDE SURFACES.  
AD-A281 311  
RESONANT CHARGE TRANSFER IN  
HYPERTHERMAL ATOMIC AND MOLECULAR ION-

UNCLASSIFIED  
SUBJECT INDEX

- SURFACE COLLISIONS.  
AD-A281 369
- FIRST-PRINCIPLES-DERIVED RATE  
CONSTANTS FOR H ADATOM SURFACE  
DIFFUSION ON Si(100)-2X1,  
AD-A284 143
- \*SYMPATHETIC NERVOUS SYSTEM  
GRADUATE STUDENT TRAINING IN  
CHRONIOLOGY. (FY91 ASSERT). THE  
SUPRACHIASMATIC NUCLEUS CONTROLS THE  
CIRCADIAN RHYTHM OF HEART RATE VIA  
THE SYMPATHETIC NERVOUS SYSTEM.  
AD-A284 132
- \*SYNAPSE  
CELLULAR NEUROPHYSIOLOGY OF THE RAT  
SUPRACHIASMATIC NUCLEUS: ELECTRICAL  
PROPERTIES, NEUROTRANSMISSION, AND  
MECHANISMS OF SYNCHRONIZATION.  
AD-A284 111
- \*SYNTHESIS(CHEMISTRY)  
MATERIALS FOR SECOND AND THIRD ORDER  
NONLINEAR OPTICAL APPLICATIONS.  
AD-A281 304
- DESIGN STRATEGIES FOR THE PREPARATION  
OF POLYMERIC ORGANIC SUPERCONDUCTORS.  
AD-A281 306
- DESIGN AND SYNTHESIS OF ORGANIC  
SUPERCONDUCTORS (FY92 URI/RIP).  
AD-A281 308
- NOVEL POLYMERIC COMPOSITES THROUGH  
MOLECULAR ENGINEERING.  
AD-A284 168
- \*TARGET ACQUISITION  
VISUO-OCULAR PERFORMANCE DURING  
VESTIBULAR STIMULATION.  
AD-A284 103
- \*TARGETS  
DEVELOPING GUIDED SEARCH 3.0. THE  
NEXT GENERATION OF A MODEL VISUAL  
SEARCH.  
AD-A283 956
- \*THERMAL PROPERTIES  
THERMAL RELAXATION PROCESSES AND
- STABILITY IN POLED ELECTRO-OPTIC  
POLYMERS.  
AD-A283 948
- \*THERMODYNAMICS  
THERMODYNAMICS OF THE ANION ORDERING  
TRANSITIONS IN (TMTSF)2REO4 AND  
(TMTSF)2BF4,  
AD-A281 119
- \*THERMOMECHANICS  
STRUCTURAL INTEGRITY OF INTELLIGENT  
MATERIALS AND STRUCTURES.  
AD-A280 941
- \*THIN FILMS  
SINGLE CRYSTAL FILMS AND WAVEGUIDES  
OF ORGANIC MATERIALS: PREPARATION AND  
NONLINEAR OPTICAL PROPERTIES.  
AD-A284 471
- ENHANCED QUANTUM DOT NONLINEAR  
OPTICALS MATERIALS.  
AD-B187 187
- \*THIOPHENES  
SYSTEMATIC OPTIMIZATION OF SECOND  
ORDER NONLINEAR OPTICAL MATERIALS.  
AD-A281 350
- \*THORIUM  
LASER SPECTROSCOPY OF UO:  
CHARACTERIZATION AND ASSIGNMENT OF  
STATES IN THE 0- TO 3-EV RANGE, WITH  
A COMPARISON TO THE ELECTRONIC  
STRUCTURE OF THO.  
AD-A282 546
- \*THREE DIMENSIONAL  
COOPERATIVITY AND 3-D REPRESENTATION.  
AD-A284 203
- \*TIME SERIES ANALYSIS  
SIGNET-SOFTWARE TOOLS FOR SIGNAL  
IDENTIFICATION USING NEURAL NETWORKS.  
AD-A284 362
- \*TIN  
HYDROLYSIS AND CONDENSATION OF TIN  
(IV) ALKOXIDE COMPOUNDS: THE CONTROL
- OF STRUCTURAL EVOLUTION.  
AD-A282 789
- \*TISSUES(BIOLOGY)  
THEORETICAL MODELING OF OCULAR TISSUE  
DAMAGE BY SHORT PULSE LASER.  
AD-A280 928
- \*TOLERANCES(PHYSIOLOGY)  
THE CHRONIC EFFECTS ON JP-8 JET FUEL  
EXPOSURE ON THE LUNGS.  
AD-A280 982
- \*TOLUENES  
MECHANISTIC MODELS OF SOOT FORMATION.  
AD-A284 257
- \*TOXIC HAZARDS  
BIOTRANSFORMATION OF TOXIC METALS BY  
BACTERIA.  
AD-A280 893
- \*TOXICITY  
HEPATIC TOXICITY OF  
PERFLUOROCARBOXYLIC ACIDS.  
AD-A281 310
- THE ROLE OF CHEMICAL INHIBITION OF  
GAP JUNCTIONAL INTERCELLULAR  
COMMUNICATION IN TOXICOLOGY.  
AD-A282 452
- DEVELOPMENT OF TECHNIQUES FOR THE  
EVALUATION OF TOXICANT IMPACTS TO  
MULTISPECIES SYSTEMS.  
AD-A284 426
- \*TOXICOLOGY  
STRUCTURE-ACTIVITY RELATIONSHIPS OF  
CHLORINATED ALICYCLIC COMPOUNDS IN  
CATFISH.  
AD-A280 927
- RESEARCH TRAINING OF THE EFFECTS OF  
TOXIC SUBSTANCES ON THE LUNGS. (FY91  
AASERT).  
AD-A284 165
- \*TOXINS AND ANTITOXINS  
ALDEHYDIC PRODUCTS OF LIPID  
PEROXIDATION IN THE RETINA GENERATED  
BY ENVIRONMENTAL TOXINS.

UNCLASSIFIED  
SUBJECT INDEX

AD-A284 172

- \*TRAINING  
INTERDISCIPLINARY TRAINING IN LIFE  
SCIENCES (FY91 ASSERT).  
AD-A282 938
- \*TRANSITIONS  
AC CALORIMETRY AT CDW AND SDW  
TRANSITIONS,  
AD-A281 117  
THERMODYNAMICS OF THE ANION ORDERING  
TRANSITIONS IN (TMTSF)2RdO4 AND  
(TMTSF)2BF4,  
AD-A281 119  
THEORETICAL DETERMINATION OF CHARGE-  
TRANSFER AND LIGAND FIELD TRANSITION  
ENERGIES FOR FeCl4 - USING THE EOM-  
CCSD METHOD,  
AD-A284 198
- \*TRANSONIC FLOW  
TRANSONIC FLOW SEPARATION IN CLOSED  
CURVED CHANNELS.  
AD-A280 728
- \*TRANSPLANTATION  
TRANSPLANTATIONS AND CLONING OF AN  
IMMORTAL CELL LINE FROM RAT SCN.  
AD-A280 978
- \*TUNNELING  
LARGE AMPLITUDE MOTIONS, ESPECIALLY  
ISOMERIZATION AND TUNNELING IN  
POLYATOMIC MOLECULE SPECTRA: NOVEL  
EXPERIMENTAL, PATTERN RECOGNITION,  
AND THEORETICAL METHODS.  
AD-A284 194  
A FULL-DIMENSIONAL SEMICLASSICAL  
CALCULATION OF VIBRATIONAL MODE  
SELECTIVITY IN THE TUNNELING  
SPLITTING IN A PLANAR MODEL OF  
MALONALDEHYDE,  
AD-A284 772
- \*TURBULENT BOUNDARY LAYER  
INTERACTION OF CHEMISTRY, TURBULENCE,  
AND SHOCK WAVES IN HYPERVELOCITY FLOW.  
AD-A282 941

- \*TURBULENT FLOW  
A SIMULATION OF PARTICLE DISPERSION  
IN A TURBULENT JET,  
AD-A280 930  
A TECHNIQUE FOR MEASURING LAGRANGIAN  
AND EULERIAN PARTICLE STATISTICS IN A  
TURBULENT FLOW,  
AD-A280 932  
THEORIES OF TURBULENT COMBUSTION IN  
HIGH SPEED FLOWS.  
AD-A280 933  
MEASUREMENTS AND SIMULATIONS OF  
PARTICLE DISPERSION IN A TURBULENT  
FLOW,  
AD-A280 973  
MEASUREMENTS OF DROPLET DISPERSION IN  
HEATED AND UNHEATED TURBULENT JETS.  
AD-A284 252
- \*TWO PHOTON ABSORPTION  
ELECTRON TRANSPORT REACTIONS BETWEEN  
PYRENE AND METHYLVIOLOGEN IN A MODEL  
BIOLOGICAL MEMBRANE.  
AD-A283 184
- \*URANIUM COMPOUNDS  
LASER SPECTROSCOPY OF UO:  
CHARACTERIZATION AND ASSIGNMENT OF  
STATES IN THE 0- TO 3-EV RANGE, WITH  
A COMPARISON TO THE ELECTRONIC  
STRUCTURE OF THO.  
AD-A282 546
- \*VELOCITY  
THEORIES OF TURBULENT COMBUSTION IN  
HIGH SPEED FLOWS.  
AD-A280 933
- \*VESTIBULAR APPARATUS  
VISUO-OCULAR PERFORMANCE DURING  
VESTIBULAR STIMULATION.  
AD-A284 103
- \*VIBRATION  
VIBRATIONAL SPECIFICITY FOR CHARGE  
TRANSFER VERSUS DEACTIVATION IN N2+(V  
= 0,1,2) + AR AND O2 REACTIONS,  
AD-A284 200

- A FULL-DIMENSIONAL SEMICLASSICAL  
CALCULATION OF VIBRATIONAL MODE  
SELECTIVITY IN THE TUNNELING  
SPLITTING IN A PLANAR MODEL OF  
MALONALDEHYDE,  
AD-A284 772
- \*VIGILANCE  
LOCUS COERULEUS, VIGILANCE AND STRESS:  
BRAIN MECHANISMS OF ADAPTIVE  
BEHAVIORAL RESPONSIVENESS.  
AD-A282 450
- \*VISCOELASTICITY  
ENERGY DECAY AND CONTROL FOR ELASTIC  
AND VISCOELASTIC DISTRIBUTED  
PARAMETER SYSTEMS.  
AD-A281 312
- \*VISCIOUS FLOW  
COMPUTATIONAL METHODS FOR PDES IN  
FLOW CONTROL, SUPERCONDUCTIVITY,  
FLUID FLOWS AND OTHER APPLICATIONS.  
AD-A282 912
- \*VISION  
ALDEHYDIC PRODUCTS OF LIPID  
PEROXIDATION IN THE RETINA GENERATED  
BY ENVIRONMENTAL TOXINS.  
AD-A284 172  
COMPUTATIONAL VISION BASED ON  
NEUROBIOLOGY.  
AD-A284 472
- \*VISUAL PERCEPTION  
PRESENTATIONS OF SHAPE IN OBJECT  
RECOGNITION AND LONG-TERM VISUAL  
MEMORY.  
AD-A281 336  
VISUAL PSYCHOPHYSICS OF EGOMOTION.  
AD-A282 547  
VISUAL MOTION PERCEPTION AND VISUAL  
INFORMATION PROCESSING.  
AD-A282 928
- \*VISUAL TARGETS  
DEVELOPING GUIDED SEARCH 3.0. THE  
NEXT GENERATION OF A MODEL VISUAL  
SEARCH.

AD-A283 956

\*VORTEX SHEDDING  
A SIMULATION OF PARTICLE DISPERSION  
IN A TURBULENT JET,  
AD-A280 930

\*WATER POLLUTION  
RESEARCH TRAINING FOR UNDERSTANDING  
THE FATE OF ENVIRONMENTAL POLLUTANTS.  
(FY91 AASERT).  
AD-A284 164

\*WAVE PROPAGATION  
MATHEMATICAL PROBLEMS OF NONLINEAR  
WAVE PROPAGATION AND OF WAVES IN  
HETEROGENEOUS MEDIA.  
AD-A282 217

\*WAVEGUIDES  
SINGLE CRYSTAL FILMS AND WAVEGUIDES  
OF ORGANIC MATERIALS: PREPARATION AND  
NONLINEAR OPTICAL PROPERTIES.  
AD-A284 471

\*X RAYS  
SYNTHESIS, SUPERCONDUCTIVITY, X-RAY  
STRUCTURE AND ELECTRONIC BAND  
STRUCTURE OF WAVELENGTHS-(BETS)2GACL4,  
AD-A281 224

## ABSTRACTS

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-B189 498L 20/3 12/6

AD-B189 498L CONTINUED

ADVANCED TECHNOLOGY MATERIALS INC DANBURY CT

(U) 'Superconductor Magnetic Memory'.  
FERRITES, JOSEPHSON JUNCTIONS, LOW POWER, OXIDES, THIN FILMS, VELOCITY, VIABILITY, YTTRIUM IRON GARNET, DESIGN CRITERIA, FABRICATION, CHEMICAL VAPOR DEPOSITION, MAGNETIZATION, TEST AND EVALUATION.

DESCRIPTIVE NOTE: Final technical rept. 1 Jul 93-30 Apr 94,

IDENTIFIERS: (U) WUAFOSR160201, YBCO(Yttrium Barium Copper Oxide)

SEP 94 18P

PERSONAL AUTHORS: Steinbeck, John; Zhang, Jiming; Li, Yi-  
Quin

CONTRACT NO. F49620-93-C-0034

PROJECT NO. 1602

TASK NO. 01

MONITOR: AFOSR, XC  
TR-94-0572, AFOSR

UNCLASSIFIED REPORT

Distribution authorized U.S. Gov't. agencies only:  
Premature Dissemination and Proprietary Info.; 23 Sep 94.  
Other requests shall be referred to Air Force Office of  
Scientific Research, Bolling AFB, DC 20332-0001.

ABSTRACT: (U) In order to realize a completely superconducting computer architecture, both logic and memory circuits must be fabricated. Present memory designs based on Josephson junction devices possess great speed advantages over present semiconductor devices. Unfortunately, fabricating large (> 4 K memory elements) is only accomplished with great difficulty. An alternative memory architecture based on magnetic components can overcome this shortcoming while preserving the speed and low power advantages of Josephson junction based circuits. This work demonstrates the viability of a superconducting magnetic memory architecture by fabricating core memory devices using thin films of the high temperature superconductor yttrium barium copper oxide and the ferrite yttrium iron garnet. High temperature superconductor, Yttrium caper oxide, Ferrite, Yttrium iron garnet, Magnetic, Memory device.

DESCRIPTORS: (U) \*HIGH TEMPERATURE SUPERCONDUCTORS,  
\*MEMORY DEVICES, BARIUM, COMPUTER ARCHITECTURE, COPPER,

AD-B189 498L

AD-B189 498L

UNCLASSIFIED

PAGE

1

T4035K



UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-B189 350L 1/3 9/1 20/3 AD-B189 350L CONTINUED

SQM TECHNOLOGY INC LA JOLLA CA

(U) High Temperature SQUID Microprobe for Eddy Current Evaluation of Airframes.

DESCRIPTIVE NOTE: Final technical rept.,

AUG 94 53P

PERSONAL AUTHORS: Podney, Walter

REPORT NO. SQMT-94-020R

CONTRACT NO. F49620-93-C-0036

PROJECT NO. 3005

TASK NO. SS

MONITOR: AFOSR, XC  
TR-94-0473, AFOSR

DESCRIPTORS: (U) \*AIRFRAMES, \*EDDY CURRENTS, \*HIGH TEMPERATURE SUPERCONDUCTORS, ALUMINUM, ARRAYS, CORROSION, CRACKS, CRYOGENICS, HIGH RESOLUTION, HIGH SENSITIVITY, HIGH TEMPERATURE, IMAGES, INTERFERENCE, LOOPS, LOW FREQUENCIES, PROTOTYPES, SENSITIVITY, SUPERCONDUCTIVITY, NONDESTRUCTIVE TESTING, AGING(MATERIALS), FATIGUE(MECHANICS).

IDENTIFIERS: (U) WUAFOSR3005SS, SQUID(Superconducting Quantum Interference Devices)

IAC NO. NT-51332

IAC DOCUMENT TYPE: NTIAC - MICROFICHE --

IAC SUBJECT TERMS: N--(U) AIRFRAMES, EDDY CURRENTS, HIGH TEMPERATURE, SUPERCONDUCTORS, ALUMINUM, ARRAYS, CORROSION, CRACKS, CRYOGENICS, HIGH RESOLUTION, IMAGES, LOW FREQUENCY, SENSITIVITY, SUPERCONDUCTIVITY, AGING(MATERIALS), FATIGUE(MECHANICS);

# UNCLASSIFIED REPORT

Distribution authorized to U.S. Gov't. agencies only; Proprietary Info.; 7 Sep 94. Other requests shall be referred to Air Force Office of Scientific Research/NE, Bolling AFB, DC 20332-0001.

ABSTRACT: (U) High-temperature superconductors offer an opportunity to bring superconductive quantum interference devices, SQUIDS, into common use for evaluating underlayers of aging airframes with eddy currents. The millionfold advantage in resolution of magnetic flux of a SQUID enables identification of corrosion and millimeter long fatigue cracks through 15 mm or so of aluminum. SQUIDS alone offer high sensitivity at low frequencies with 1 mm pickup loops, enabling arrays giving images of defects in underlayers with high resolution. Phase I demonstrates ability of superconducting pickup loops, 1 mm in diameter, to identify both 1 mm cracks through six, 1 mm thick layers and material loss of 5% through 15 mm of aluminum. It also demonstrates feasibility of a cryogenic battery. A prototype, 64 mm (2.5 in.) in diameter and 180 mm (7 in.) long, warms 1 K/hr, at a heat leak of 44 mW. SQUID, Eddy currents, High-temperature superconductivity, Nondestructive evaluation

AD-B189 350L

AD-B189 350L

UNCLASSIFIED

PAGE

2

T4035K



UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-B189 080 3/1 3/3

CALIFORNIA UNIV LOS ANGELES DEPT OF ASTRONOMY

(U) Fundamentals of Astrodynamics.

DESCRIPTIVE NOTE: Astrodynamical rept. no. 6,

SEP 59 375P

PERSONAL AUTHORS: Baker, Robert M.; Makenson, Maud W.

CONTRACT NO. AF 49(638)-498

MONITOR: AFOSR, XC  
TN-59-1045, AFOSR

UNCLASSIFIED REPORT

Distribution: DTIC users only.

DESCRIPTORS: (U) \*SOLAR SYSTEM, \*ECLIPSES, COMETS, N  
BODY PROBLEM, INTERPLANETARY SPACE, GRAVITATIONAL FIELDS,  
EARTH ORBITS, METEORITES, ELLIPTICAL ORBIT TRAJECTORIES,  
EQUATIONS OF MOTION, PERTURBATIONS.

IDENTIFIERS: (U) Astronomical constants

AD-B188 916 20/9 22/2 22/5

AVCO EVERETT RESEARCH LAB INC EVERETT MA

(U) Analysis of Constant Velocity Pulsed Plasma  
Accelerator.

JUL 60 34P

PERSONAL AUTHORS: Stekly, Z. J.

REPORT NO. RR-89

CONTRACT NO. AF 49(638)-659

MONITOR: AFOSR, XC  
TN-60-935, AFOSR

UNCLASSIFIED REPORT

Distribution: DTIC users only.

ABSTRACT: (U) The equations are set down in a  
dimensionless form for a constant velocity pulsed plasma  
accelerator, treating the accelerator as a circuit  
element. The equations are solved in closed form and  
plots of voltage, current, gas energy and required mass  
inductance both reduces and delays the energy transfer  
from the capacitors to the gas. A typical design for a  
constant velocity pulsed plasma accelerator is obtained  
making use of the dimensionless plots obtained as a  
result of the analysis.

DESCRIPTORS: (U) \*PLASMA ACCELERATORS, \*SPACE PROPULSION,  
VELOCITY, ENERGY TRANSFER, POWER SUPPLIES.

AD-B189 080

UNCLASSIFIED

PAGE

3

T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-B187 187 CONTINUED

AD-B187 187 9/1 20/6 11/4

MATERIALS TECHNOLOGIES CORP MONROE CT

(U) Enhanced Quantum Dot Nonlinear Optical Materials.

DESCRIPTIVE NOTE: Final technical rept. Oct 91-Jun 94,

JUL 94 90P

PERSONAL AUTHORS: Mehrotra, Yogesh; Schwerzel, Robert E.;  
Gallatin, Gregg

REPORT NO. W/O-9121

CONTRACT NO. F49620-92-C-0003

PROJECT NO. 1602

TASK NO. 01

MONITOR: AFOSR, XC  
TR-94-0466, AFOSR

UNCLASSIFIED REPORT

Distribution authorized to U.S. Gov't. agencies only;  
Proprietary Info.; 26 Jul 94. Other requests shall be  
referred to Air Force Office of Scientific Research/NE,  
Bldg. 410, Bolling AFB, DC 20332-6448.

ABSTRACT: (U) This Phase I SBIR program has successfully  
demonstrated the feasibility of fabricating high-quality  
thin films of a new class of improved nonlinear optical  
materials, which we refer to as composite 'nonlinear-  
nonlinear' optical materials. Potential applications of  
these materials include all-optical signal processing or  
beam-steering devices for communications and optical  
computing systems, dynamical holography etc. These novel  
composite materials are comprised of colloidal 'quantum-  
dot' semiconductor particles embedded in an organic  
nonlinear optical polymer. The material system can be  
designed such that when the components are chosen  
properly, the nonlinear response of the resulting  
composite is enhanced over a significantly broader  
wavelength range than either of the two components alone.  
For the Phase I SBIR program, colloidal crystallites of  
cadmium sulfide (typically 35-40A in diameter) coated  
with a monolayer of thiophenol (an organic compound with  
a relatively weak nonlinear optical response) were

embedded in a multilayer film of polydiacetylene (an  
organic polymer having a relatively strong nonlinear  
optical response). The concentration of cadmium sulfide  
was adjusted such that the particles occupied  
approximately 10% of the volume of the film. By using  
such techniques as degenerate four-wave mixing and Z-scan,  
our CdS-PDA composite film was shown to have a nonlinear  
refractive index that was roughly 3 to 4 times larger  
than that of a similar polydiacetylene film without the  
particles. This result is consistent with mathematical  
modeling studies that were carried out to help guide the  
development of improved materials of this type. In Phase  
II program, these results will be extended to other  
combinations of semiconductors and polymers which should  
provide still greater nonlinear optical response  
enhancements.

DESCRIPTORS: (U) \*COMPOSITE MATERIALS, \*OPTICAL  
MATERIALS, \*THIN FILMS, \*NONLINEAR OPTICS, BEAM STEERING,  
CADMIUM SULFIDES, FOUR WAVE MIXING, HOLOGRAPHY, ORGANIC  
COMPOUNDS, POLYMERS, REFRACTIVE INDEX, SEMICONDUCTORS,  
SIGNAL PROCESSING, SULFIDES, ELECTRIC FIELDS, DOPING,  
PHOTONS, OPTICAL COATINGS, BEAM SPLITTING.

IDENTIFIERS: (U) WUAFOSR160201, Quantum dots.

AD-B187 187

AD-B187 187

UNCLASSIFIED

PAGE

4

T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-B187 142 20/10 CONTINUED

SVT ASSOCIATES INC EDEN PRAIRIE MN

(U) Quantum Well and Superlattice IR Detector Development.  
Phase 1.

EPITAXIAL GROWTH, HIGH ENERGY, LAYERS, LONG WAVELENGTHS,  
OSCILLATION, PARAMETERS, QUALITY, REFLECTION,  
SEMICONDUCTORS, TEMPERATURE, WAFERS, CRYSTAL STRUCTURE,  
ABSORPTION SPECTRA.

DESCRIPTIVE NOTE: Final rept.,

FEB 94 37P

PERSONAL AUTHORS: Chow, Peter

CONTRACT NO. F49620-93-C-0047

MONITOR: AFOSR, XC  
TR-94-0433, AFOSR

UNCLASSIFIED REPORT

Distribution authorized to DoD only; Proprietary Info.;  
26 Jul 94. Other requests shall be referred to AFOSR, 110  
Duncan Ave., Suite B115, Boiling AFB, DC 20332-0001.

ABSTRACT: (U) This project is to develop very long wavelength infrared (VLWIR) detector by fabricating, InAs/GaSb strained-layer superlattices on the (111) substrates. Like all zincblende structures the III-V semiconductors are piezoelectric with the largest effect along the (111) orientation. The fields cause a tilting of the energy bands, and lead to a red shift of the band edge and changes in oscillation strength, both very desirable for VLWIR detector applications. We have performed a thorough theoretical analysis of suitable material parameters, and experimental investigation of the epitaxial growth process on wafers of this particular orientation. The calculation indicated very thin layers are adequate for this wavelength cutoff, thereby enhancing the absorption. Reflection High Energy Electron Diffraction (RHEED) has been used extensively to examine the growth conditions. For epitaxy growth along this direction there is only a narrow temperature window. Superlattice on the (111) substrate have been demonstrated for the first time. We have also discovered high quality lattice matched insulating AlSb and semimetal Sb layers for novel device applications. MBE, Superlattice, IR, Detector, III-V Compounds

DESCRIPTORS: (U) \*SUPERLATTICES, \*INFRARED DETECTORS,  
\*QUANTUM WELLS, ELECTRON DIFFRACTION, ENERGY BANDS,

AD-B187 142

AD-B187 142

UNCLASSIFIED

PAGE

5

T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-B186 566L 25/1

AD-B186 566L CONTINUED

PHOTONICS RESEARCH INC LONGMONT CO

(U) Photonic Computer Links Using Multi-Channel Vertical-Cavity Surface-Emitting Laser Arrays.

DESCRIPTIVE NOTE: Final technical rept. 31 Aug 93-30 Apr 94,

MAY 94 47P

PERSONAL AUTHORS: Bryan, Robert; Jewell, Jack; Swirhun, Stan

REPORT NO. PRIB-TR-94-0004

CONTRACT NO. F49620-93-C-0064

PROJECT NO. 1602

TASK NO. 01

MONITOR: AFOSR, XC  
TR-94-0398, AFOSR

UNCLASSIFIED REPORT

Distribution authorized to U.S. Gov't. agencies only; Premature Dissemination; 7 Apr 94. Other requests shall be referred to AFOSR/NE, Bolling AFB 20332-0001.

ABSTRACT: (U) Light based communication is one of the most rapidly growing optoelectronic market segments and will become the dominant pathway of the Information Superhighway. PRI's low-cost, small footprint, integrated, multichannel optoelectronic solution is an important enabling technology for this new era of optical communication. PRI has developed two market driven system architectures that exploit the multi-channel capability of the vertical-cavity surface-emitting laser array (LASE-ARRAY(TM)) technology. A wavelength division multiplexing architecture based on dynamic synchronous Transfer Mode (DTM) protocol is describe for optical local area network applications. The architecture eliminates the requirement for precise wavelength control of source lasers in a WDM environment. Also a low-cost, high-speed parallel fiber optic datacom module is designed to meet the inability of current links to provide needed bandwidth for point-to-point links at low cost. Performance is maintained while

cost is minimized by incorporating LASE-ARRAYs and CMOS ASIC drive circuits to achieve multi-gigabit/sec data channels. The analysis and specification of the systems are supported by a feasibility study of the components. The individual components including multi-channel LASE-ARRAYs and intelligent, adaptive receivers are specified, analyzed and characterized. Optical communication, wavelength division multiplexing, Vertical-cavity surface-emitting lasers, ATM/DTM, Parallel fiber optic communication

DESCRIPTORS: (U) \*OPTICAL COMMUNICATIONS, ARRAYS, BANDWIDTH, CAVITIES, CHANNELS, CIRCUITS, CONTROL, COSTS, DRIVES, DYNAMICS, ENVIRONMENTS, FEASIBILITY STUDIES, FIBER OPTICS, LASERS, LIGHT, LOCAL AREA NETWORKS, LOW COSTS, MULTICHANNEL, MULTIPLEXING, RECEIVERS, REQUIREMENTS, SPECIFICATIONS, SURFACES, TRANSFER, VELOCITY, COMPUTER ARCHITECTURE, DATA LINKS, EMITTERS.

IDENTIFIERS: (U) PE63218C, WUAFOSR160201.

AD-B186 566L

AD-B186 566L

UNCLASSIFIED

PAGE

46

T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A284 898 CONTINUED

MATERIALS RESEARCH SOCIETY PITTSBURGH PA

(U) Low Temperature Grown and Highly Non-Stoichiometric GaAs and Related Materials.

DESCRIPTIVE NOTE: Final rept. 1 Apr 93-30 Mar 94,

AUG 94 151P

PERSONAL AUTHORS: Look, David C.; Melloch, Michael R.

CONTRACT NO. F49620-93-1-0236

PROJECT NO. 2305

TASK NO. CS

MONITOR: AFOSR, XC  
TR-94-0574, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) Forty-one papers were presented in five sessions, as follows: Growth Issues, including growth of As and P-based compounds, annealing effects, and characterization by scanning tunneling microscopy (STM) real-time ellipsometry, and positron annihilation; Processing and Characterization, including point-defect and precipitate formations and their characterization by electrical, optical magnetic resonance, and STM techniques; Optical and Optoelectronic Properties, including the materials GaAs, InGaAs, and InGaP, and their responses to light stimulation, explained by various models; InP and Related Ternary Materials, including the materials InP, InGaAs, InAlAs, and ordered InGaAs/InAlAs layers, characterized by optically detected magnetic resonance, electrical measurements, tunneling electron microscopy, and photoreflectance; Applications of Nonstoichiometric Materials, including power MESFET design, phase noise measurements, coherent microwave generation, excitonic electro-optic observations, and GaAs on Si device applications.

DESCRIPTORS: (U) \*PERIODICALS, \*LOW TEMPERATURE, \*EPITAXIAL GROWTH, \*GALLIUM ARSENIDES, \*STOICHIOMETRY, \*OPTICAL PROPERTIES, \*ELECTRONICS, COMPOSITE MATERIALS, SYMPOSIA, PHOSPHORUS, ANNEALING, MICROSCOPY, SCANNING, TUNNELING, ELLIPSOMETERS, POSITRONS, ANNIHILATION

AD-A284 898

AD-A284 898

UNCLASSIFIED

PAGE

7

T4035K

REACTIONS, POINT DEFECTS, PRECIPITATES, INDIUM PHOSPHIDES, METALS, TERNARY COMPOUNDS, ALUMINUM ARSENIDES, SEMICONDUCTORS, FIELD EFFECT TRANSISTORS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2305CS, MESFET(Metal Semiconductor Field-Effect Transistor), Optoelectronics, \*Nonstoichiometric materials

## UNCLASSIFIED

## DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. T4035K

AD-A284 861 5/8

RICE UNIV HOUSTON TX

(U) Comparing Performance on Implicit Memory Tests.

DESCRIPTIVE NOTE: Annual technical rept. 1 Aug 93-31 Jul 94,

AUG 94 9P

PERSONAL AUTHORS: Roediger, Henry, III

CONTRACT NO. F49620-92-J-0437

PROJECT NO. 2313

TASK NO. BS

MONITOR: AFOSR, XC  
TR-94-0577, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The second year of this grant saw progress on 9 projects briefly described below. In particular, in the past year 5 papers or chapters have been published, 6 are in press, 3 are in preparation, and data are being collected on several new projects. My students and I have presented 6 papers on work conducted under the auspices of the grant at national and international meetings in the past year. We have completed projects on the following topics: (1) Effects of imagery on nonverbal implicit tests; (2) Effects of high priority events on implicit tests; (3) Specificity of priming on verbal and nonverbal perceptual tests; (4) Direct comparison of two methods of testing for contamination of implicit tests by conscious recollection; (5) The experimental basis of serial position effects; and (6) A new paradigm for the study of false memories. Four or five other projects should be completed during the final year of the grant. Implicit memory, Memory

DESCRIPTORS: (U) \*MEMORY (PSYCHOLOGY), \*PERFORMANCE TESTS, \*COMPARISON, \*CONTAMINATION, \*GRANTS, \*INTERNATIONAL, \*PREPARATION, \*STUDENTS, \*TEST AND EVALUATION, \*WORK.

IDENTIFIERS: (U) PE61102F, WUAFOSR2313BS.

AD-A284 861

UNCLASSIFIED

AD-A284 859 7/4 11/6 7/2

TENNESSEE UNIV KNOXVILLE DEPT OF CHEMISTRY

(U) AASERT-93: Electroplating of Refractory Metals Using Haloaluminate Melts.

DESCRIPTIVE NOTE: Annual rept. 1 Aug 93-31 Jul 94,

AUG 94 5P

PERSONAL AUTHORS: Mamantov, Gleb

CONTRACT NO. F49620-93-1-0463

PROJECT NO. 3484

TASK NO. XS

MONITOR: AFOSR, XC  
TR-94-0580, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The main objective of this research, performed by Sven E. Eklund, a graduate student at the Univ of Tennessee, Knoxville, is to explore the fundamentals of electroplating of several refractory metals, such as tungsten and tantalum, from chlorofluoroaluminate melts and to compare with electroplating of these elements from the LiF-NaF-KF eutectic. There has been considerable interest in the electrochemistry and metallurgy of the Groups IV-B, V-B, and VI-B4 transition metals (so-called refractory metals) because of the potential use of these metals in electronic components, electrical devices, and the aerospace industry. Pure, coherent deposits of these metals were originally obtained by a method developed by Mellors and Senderoff (1) in 1965. This method uses electrolytic reduction to the metal from the ternary eutectic LiF-NaF-KF, or FLINAK. Mechanisms proposed in several articles by Senderoff and coworkers for the reduction of several metals (2-5) have spurred research into the refractory metals in molten fluorides.

DESCRIPTORS: (U) \*ELECTROPLATING, \*REFRACTORY METALS, \*HALOGENS, \*ALUMINATES, \*AEROSPACE INDUSTRY, \*DEPOSITS, \*ELECTROCHEMISTRY, \*ELECTRONICS, \*EUTECTICS, \*FLUORIDES, \*MELTS, \*METALLURGY, \*METALS, \*REDUCTION, \*STUDENTS, \*TANTALUM, \*TRANSITION METALS, \*TRANSITIONS, \*TUNGSTEN, \*CHLORINE,

AD-A284 859

PAGE 8 T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A284 859 CONTINUED

AD-A284 781 5/8 6/4

COHERENCE, ELECTROLYTES, MOLTEN SALTS.

MASSACHUSETTS UNIV AMHERST

IDENTIFIERS: (U) PEG1103D, WUAFOSR3484XS,  
\*Halocaluminates, FLINAK(LiF-NaF-KF)

(U) Biological and Theoretical Studies of Adaptive  
Networks: The Conditioned Response.

DESCRIPTIVE NOTE: Final technical rept. 1 Aug 92-31 Jul  
94,

AUG 94 15P

PERSONAL AUTHORS: Moore, John W.

CONTRACT NO. F49620-92-J-0387

PROJECT NO. 2312

TASK NO. BS

MONITOR: AFOSR, XC

TR-94-0576, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) Investigations of adaptive neural networks were conducted using the classically conditioned eyeblink of rabbit, a widely used model system for studies of learning and memory. Our work has focused on processes that mediate adaptive timing of conditioned responses, an important question in the field of learning and motor control. The following experimental projects were conducted: (a) A recording study of the medial geniculate neurons during two-tone differential trace conditioning. (c) A recording study of the ventrolateral pontine reticular formation and pontine nuclei during two-tone differential conditioning. (d) Anatomical experiments using WGA-HRP that clarify cerebellar and red nucleus circuits involved in eyeblink conditioning. (e) Behavioral experiments examining the role of temporal uncertainty in conditioned response timing and topography. (d) Behavioral experiments on asynchronous bilateral eyelid conditioning in rabbits. Adaptive networks, Learning, Computational models, Biological substrates

DESCRIPTORS: (U) \*CONDITIONED RESPONSE, \*LEARNING, \*NEURAL NETS, \*MOTOR NEURONS, CIRCUITS, CONTROL, MODELS, NERVE CELLS, NUCLEI, RABBITS, RETICULAR FORMATION, SUBSTRATES, TOPOGRAPHY, UNCERTAINTY, BIOLOGY, COMPUTATIONS.

AD-A284 859

AD-A284 781

UNCLASSIFIED

PAGE

9

T4035K



UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. T4035K

AD-A284 781 CONTINUED

AD-A284 780 21/2 20/4 20/5 21/8.1

IDENTIFIERS: (U) WUAFOSR2312BS, \*EyebLink

PENNSYLVANIA STATE UNIV UNIVERSITY PARK

(U) Combustion Instability Phenomena of Importance to Liquid Propellant Engines.

DESCRIPTIVE NOTE: Final rept. 1 Jul 91-30 Jun 94,

AUG 94 80P

PERSONAL AUTHORS: Santoro, Robert J.; Anderson, William E.

CONTRACT NO. AFOSR-91-0336

PROJECT NO. 2308

TASK NO. A1

MONITOR: AFOSR, XC  
TR-94-0578, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) A systematic study of the atomization of impinging liquid jets was performed. Effects of jet flow condition, orifice diameter, impingement angle, pre-impingement length, fabrication procedure, and jet velocity at steady and oscillating, and atmospheric- and high-pressure ambient conditions were investigated. Measurements of sheet breakup length, drop size and velocity distribution, and the length between sheet structures and detached ligaments were made. Results of the experiments were compared to theoretical predictions. It appears that primary breakup of the sheets formed by turbulent impinging jets is controlled by pressure and momentum fluctuations in the liquid that are accentuated near the impingement point and that have their origin in the jet prior to impingement. Based on these results, approaches to modeling impinging jet atomization should focus on pre-impingement jet conditions and the physics near the jet impingement point. Experimental results were also studied in the context of an empirical correlation used in industry for the prediction of combustion stability. The frequency with which the periodic disturbances that control primary breakup are formed has a marked similarity to the combustion instability frequency predicted by the stability correlation. Furthermore, an increase in predicted stability coincides with an increase in measured mean drop size and an

AD-A284 781

AD-A284 780

UNCLASSIFIED

PAGE 10 T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. T4035K

AD-A284 780 CONTINUED

AD-A284 772 7/4 7/3 20/10 20/5

increase in the polydispersity of the drop size distribution. Impinging jet injectors, Combustion instability, Atomization

DESCRIPTORS: (U) \*COMBUSTION, \*IMPINGEMENT, \*INSTABILITY, \*JET FLOW, \*LIQUID PROPELLANTS, \*LIQUID PROPELLANT ROCKET ENGINES, ANGLES, ATMOSPHERICS, ATOMIZATION, COMBUSTION STABILITY, CONTROL, CORRELATION, DIAMETERS, DISTRIBUTION, DROPS, FABRICATION, FLOW, FREQUENCY, HIGH PRESSURE, INJECTORS, LENGTH, LIGAMENTS, LIQUID JETS, MEAN, MEASUREMENT, MOMENTUM, ORIFICES, PHYSICS, PREDICTIONS, PRESSURE, SHEETS, STABILITY, STRUCTURES, VELOCITY.

IDENTIFIERS: (U) PE61102F, WUAFOSR2308A1, Drop size, Breakup

OKLAHOMA STATE UNIV STILLWATER

(U) A Full-Dimensional Semiclassical Calculation of Vibrational Mode Selectivity in the Tunneling Splitting in a Planar Model of Malonaldehyde,

SEP 94 9P

PERSONAL AUTHORS: Guo, Yin; Sewell, Thomas D.; Thompson, Donald L.

PROJECT NO. 2303

TASK NO. FS

MONITOR: AFOSR, XC  
TR-94-0575, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Chemical Physics Letters, v224 p470-475, 22 Jul 94. Available only to DTIC users. No copies furnished by NTIS.

ABSTRACT: (U) A semiclassical method is used to treat proton tunneling in a planar model of malonaldehyde. Classical trajectories were calculated on a realistic potential-energy surface and WKB tunneling probabilities were calculated at turning points on the barrier separating the two equivalent potential wells. The calculated ground-state splitting, 24.5/cm, is in good agreement with the experimental value of 21.6/cm. Vibrational mode selectivity was studied by calculating the splitting for all 15 modes for 2 kcal/mol excitation energy (35 kcal/mol total energy). The results show significant mode specific effects for all except some C-H stretching modes. This study demonstrates that multidimensional semiclassical tunneling can be readily and accurately treated. Chemical dynamics, Tunneling, Semiclassical, Malonaldehyde

DESCRIPTORS: (U) \*PROTONS, \*SPLITTING, \*TUNNELING, \*COMPUTATIONS, \*VIBRATION, \*PLANAR STRUCTURES, BARRIERS, CHEMICALS, DYNAMICS, ENERGY, EXCITATION, GROUND STATE, MODELS, SURFACES, TRAJECTORIES, REPRINTS, ALDEHYDES, POTENTIAL ENERGY, CARBON, HYDROGEN, QUANTUM THEORY, MOLECULES, CHEMICAL REACTIONS.

AD-A284 780

AD-A284 772

UNCLASSIFIED

PAGE

11

T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. T4035K

AD-A284 772 CONTINUED

AD-A284 727 20/4 20/5

IDENTIFIERS: (U) PE61102F, WUAFOSR2303FS, Chemical physics, \*Full dimensional, \*Semiclassical, \*Malonaldehydes, Selectivity, Stretching modes

UNIVERSITY OF SOUTHERN CALIFORNIA LOS ANGELES DEPT OF AEROSPACE ENGINEERING

(U) Hypervelocity Air Flows With Finite Rate Chemistry.

DESCRIPTIVE NOTE: Annual technical rept. 1 Jul 93-30 Jun 94,

JUL 94 82P

PERSONAL AUTHORS: Boyd, I.; Hanson, R.; Holden, M.; Kunc, J.; Muntz, E. P.

CONTRACT NO. F49620-93-1-0373

PROJECT NO. 3484

TASK NO. AS

MONITOR: AFOSR, XC  
TR-94-0579, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) In the first year of this program the foundation for a productive collaboration has been laid. Using the CUBRC experiments as a focus detailed design calculation for LENS flow fields about a sphere cone have been completed and reported. Considerations of PLIF and PEBF measurements have been made for LENS as preliminary studies for this program. Very encouraging results have been obtained and reported on the efficient calculation of state and energy dependent vibrational transition probabilities. Initial PLIF measurements in a small shock tunnel have been made and reported. Nonequilibrium flows, Nonequilibrium flow computation, Nonequilibrium flow measurements, PLIF, Pulsed e-beam fluorescence, Vibrational collision probabilities

DESCRIPTORS: (U) \*FLOW FIELDS, \*NONEQUILIBRIUM FLOW, \*AIR FLOW, \*COMPUTERIZED SIMULATION, SHOCK TUNNELS, COMPUTATIONAL FLUID DYNAMICS, VIBRATION, BOUNDARY LAYER TRANSITION, FLOW VISUALIZATION, HYPERSONIC FLOW, LASER INDUCED FLUORESCENCE, MOLECULE MOLECULE INTERACTIONS.

IDENTIFIERS: (U) PE61103D, WUAFOSR3484AS, \*Real gas effects, Gas surface interaction, High energy, Temperature gradients, Particle collisions, Momentum

AD-A284 772

AD-A284 727

UNCLASSIFIED

PAGE

2

T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. T4035K

AD-A284 727 CONTINUED  
transfer, Oxygen Nitrogen

AD-A284 472 12/9 6/3

SPIE-THE INTERNATIONAL SOCIETY FOR OPTICAL ENGINEERING  
BELLINGHAM WA

(U) Computational Vision Based on Neurobiology.

DESCRIPTIVE NOTE: Final rept. Jun 93-Jun 94,

AUG 94 254P

PERSONAL AUTHORS: Lawton, Teri B.

CONTRACT NO. F49620-93-1-0274

PROJECT NO. 2313

TASK NO. AS

MONITOR: AFOSR, XC  
TR-94-0523, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) Biological systems use multiple object attributes to construct a 3D perception from an initial 2D representation. This report explores computational vision models that are based on neurobiology. Each of the fundamental levels of analysis needed for high level pattern recognition are addressed to provide new insights into the different processing modules. Papers detail methods for reconstructing 3D images from partial information, for correcting image defects, or for effectively extracting/analyzing/interpreting images of neurobiological and biomedical interest. Computational vision, Neurobiology, Image processing

DESCRIPTORS: (U) \*IMAGE PROCESSING, \*NEUROBIOLOGY, \*VISION, MODELS, PATTERN RECOGNITION, PATTERNS, PERCEPTION, PROCESSING, RECOGNITION, COMPUTER VISION, THREE DIMENSIONAL.

IDENTIFIERS: (U) WUAFOSR2313AS, PE61102F, Computational vision, Digestal images

AD-A284 727

AD-A284 472

UNCLASSIFIED

PAGE 13

T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A284 471 20/2 7/3 20/12 20/6

AD-A284 471 CONTINUED

AUBURN UNIV AL DEPT OF MATERIALS ENGINEERING

chemical groups at one or both ends

(U) Single Crystal Films and Waveguides of Organic Materials: Preparation and Nonlinear Optical Properties.

DESCRIPTORS: (U) \*OPTICAL PROPERTIES, \*SINGLE CRYSTALS, \*WAVEGUIDES, \*NONLINEAR OPTICS, \*THIN FILMS, CHEMICALS, CRYSTAL GROWTH, CRYSTALS, INTERFACES, MATERIALS, MEASUREMENT, MOLECULAR STRUCTURE, MOLECULES, OPTICAL MATERIALS, ORGANIC MATERIALS, SALTS, SELECTION, SHAPE, STRUCTURES, SULFONATES, TOLUENES, PHENYL RADICALS, NITRO RADICALS, OCTYL RADICALS, METHYL RADICALS, PYRIDINES, ACETYLENE, POLYMERS, SECOND HARMONIC GENERATION.

DESCRIPTIVE NOTE: Annual rept. 1 Apr 93-31 Mar 94,

MAR 94 5P

PERSONAL AUTHORS: Thakur, Mrinal

CONTRACT NO. F49620-93-1-0216

PROJECT NO. 2303

TASK NO. CS

MONITOR: AFOSR, XC  
TR-94-0506, AFOSR

IDENTIFIERS: (U) WUAFOSR2303CS, PE61102F, NPP(N-4-Nitrophenyl-L-Prolinol), Nitrophenyl, Prolinol polar chemical groups, COANP(2-Cyclooctylamino-5-Nitropyridine), Cyclooctylamino, Nitropyridine, DAST(4-NN-Dimethylamine-4-N-Methylstilb ar Zolium Toluene p-Sulfonate), Stilbazolium, Amphiphillic, Shear method, Polydiacetylene

# UNCLASSIFIED REPORT

ABSTRACT: (U) The objective of this program is to establish a generic method for the growth of thin single crystal films of important organic nonlinear optical materials and measurement of their nonlinear optical properties. Through the last year's effort we have successfully prepared single crystal films of three organic materials which are: i) (N-(4-Nitrophenyl)-L-prolinol) abbreviated as NPP, ii) 2-cyclooctylamino-5-nitropyridine, abbreviated as COANP, iii) 4'-N, N-dimethylamino-4-N-methylstilbazolium toluene-p-sulfonate, abbreviated as DAST. These materials have very large second order susceptibilities. Both NPP and COANP have an amphiphillic molecular structure, while DAST is an organic molecular salt. The single crystal films were prepared by a method called the shear method, with appropriate choice of the growth conditions. The shear method involves crystal growth at an interface and was originally applied to the growth of polydiacetylene films. Our results show that using the principles involved in the shear method, if the growth conditions are properly optimized for each compound, then molecules other than diacetylene are possible to organize as single crystal films. The only major condition that needs to be satisfied for this method to be applicable is that the molecule must be of an elongated shape with polar

AD-A284 471

AD-A284 471

UNCLASSIFIED

PAGE

94

T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. T4035K

AD-A284 440 20/5

AD-A284 434 20/10 7/4 7/2 20/8

FLORIDA UNIV GAINESVILLE

FLORIDA UNIV GAINESVILLE

(U) A Theoretical Study of Hyperfine Coupling Constants.

(U) Accurate Electron Affinities of Small Carbon Clusters.

JAN 94 11P

JUL 94 8P

PERSONAL AUTHORS: Perera, S. A.; Watts, John D.; Bartlett, Rodney J.

PERSONAL AUTHORS: Watts, John D.; Bartlett, Rodney J.

CONTRACT NO. F49620-93-1-0127

CONTRACT NO. F49620-93-1-0127

PROJECT NO. 2301

PROJECT NO. 2301

TASK NO. DS

TASK NO. DS

MONITOR: AFOSR, XC  
TR-94-0532, AFOSR

MONITOR: AFOSR, XC  
TR-94-0531, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

Availability: Pub. in Jnl. of Chemical Physics, v100 n2 p1425-1434, 15 Jan 94. Available only to DTIC users. No copies furnished by NTIS.

Availability: Pub. in Jnl. of Chemical Physics, v101 n1 p409-415, 1 Jul 94. Available only to DTIC users. No copies furnished by NTIS. n

ABSTRACT: (U) Isotropic hyperfine coupling constants of first-row atoms from B-F and the BH2 radical are calculated analytically from the coupled-cluster (CC) relaxed density with a variety of extended basis sets. We employ both restricted and unrestricted Hartree-Fock reference functions, with the CC singles and doubles (CCSD), CCSD with noniterative triples CCSD-T(CCS) and CCSD(T) methods. The latter provide excellent agreement with experiment. We also consider the role of orbital relaxation and atomic basis functions in accurate predictions.

ABSTRACT: (U) Coupled-cluster calculations with large basis sets have been used to calculate the electron affinities of Cn (n = 1-5). Accurate geometries have been calculated, and correlation and basis set effects have been analyzed. The most complete calculations yield results in excellent agreement with experiment, and are a significant improvement over previous calculations. The results suggest the assignment of the photodetachment data to adiabatic electron affinities, rather than vertical electron detachment energies.

DESCRIPTORS: (U) \*ATOMIC ORBITALS, ATOMS, DENSITY, PREDICTIONS, RELAXATION, ELECTRON SPIN RESONANCE, MOLECULAR STATES, FREE RADICALS, COUPLING(INTERACTION), CLUSTERING, ATOMIC ENERGY LEVELS, HARTREE FOCK APPROXIMATION, REPRINTS, BORON COMPOUNDS, HYPERFINE STRUCTURE, ELECTRON DENSITY, MOLECULAR STRUCTURE.

DESCRIPTORS: (U) \*ELECTRONS, \*CARBON, \*QUANTUM THEORY, ALLOCATIONS, CORRELATION, REPRINTS, ENERGY, CLUSTERING, ATOMS, COUPLINGS, GEOMETRY, ADIABATIC CONDITIONS, MOLECULAR STRUCTURE.

IDENTIFIERS: (U) WU2301DS, PE61102F, CC(Coupled Cluster)

IDENTIFIERS: (U) WU2301DS, PE61102F, \*Clusters, \*Affinities, \*Basis sets, Photodetachment, VEDE(Vertical Electron Detachment Energy), SCF(Self Consistent Field), MBPT(Many-Body Perturbation Theory), CC(Coupled Clusters), Chemical physics

AD-A284 440

AD-A284 434

UNCLASSIFIED

PAGE 15

T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A284 426 CONTINUED

AD-A284 426 12/9 6/11

HUXLEY COLL OF ENVIRONMENTAL STUDIES BELLINGHAM WA INST  
OF ENVIRONMENTAL TOXI COLOGY AND CHEMISTRY

(U) Development of Techniques for the Evaluation of  
Toxicant Impacts to Multispecies Systems.

DESCRIPTIVE NOTE: Final rept. 1 Jun 91-31 May 94,

MAY 94 949P

PERSONAL AUTHORS: Landis, Wayne G.

CONTRACT NO. AFOSR-91-0291

PROJECT NO. 3484

TASK NO. RS

MONITOR: AFOSR, XC  
TR-94-0524, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) In this research program, new methods of data analysis were applied to the analysis of multispecies toxicity tests using three complex toxicants. The water soluble fraction of the turbine fuels Jet-A, JP-4 and JP-8 have been examined as stressors for two microcosm protocols, the standardized aquatic microcosm (SAM) and the mixed flask culture (MFC). The SAM is a 3 L system inoculated with standard cultures of algae, zooplankton, bacteria, and protozoa. In contrast, the MFC is 1 L and is inoculated with a complex mixture of organisms derived from a natural source. Analysis of the organism counts and physical data were conducted using conventional and newly derived multivariate nonmetric clustering methods and computer visualization techniques. Several fundamental discoveries regarding the impacts of toxicants on ecological systems were made. The first is that recovery of an ecosystem in the sense that it returns to the original or reference state is not a property of these systems. In fact, it is unlikely that recovery is a property of other larger ecological systems. In our experiments the various treatment groups incorporated the information as to toxicant concentration that was expressed after periods of so-called recovery. The differentiation of the treatment groups occurred even after the elimination of the toxicant from the test

AD-A284 426

AD-A284 426

UNCLASSIFIED

PAGE

16

T4035K

system. Another fundamental discovery is that multispecies toxicity tests are not repeatable, although within one experiment the replicates of a treatment group are replicable. In other words, initial conditions are important. The outcome of this research may lead to a new viewpoint in describing the impacts of toxicants on complex ecological systems. This viewpoint is described as the Community Conditioning Hypothesis

DESCRIPTORS: (U) \*TOXICITY, \*ARTIFICIAL INTELLIGENCE, \*BIOLOGY, \*CHAOS, ALGAE, BACTERIA, CLUSTERING, COMMUNITIES, COMPUTERS, CONTRAST, CULTURE, ECOSYSTEMS, ELIMINATION, FLASKS, FUELS, IMPACT, MIXTURES, PROTOZOA, RECOVERY, STANDARDS, TEST AND EVALUATION, TRACTION, TURBINES, WATER, ZOOPLANKTON, AXES, BEHAVIOR, DECAY, JET ENGINE FUELS, TRAJECTORIES.



UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A284 400 7/2 11/6

AD-A284 399 6/4

MISSOURI UNIV-KANSAS CITY DEPT OF CHEMISTRY

STATE UNIV OF NEW YORK AT BINGHAMTON

(U) SAM1 Semiempirical Parameters.

(U) Perception of Auditory Events: Attentional Limitations.

DESCRIPTIVE NOTE: Annual rept. Feb 93-Feb 94,

DESCRIPTIVE NOTE: Annual technical rept. 1 Jul 93-30 Jun 94,

AUG 94 7P

JUL 94 5P

PERSONAL AUTHORS: Holder, Andrew J.

PERSONAL AUTHORS: Pastore, Richard E.

CONTRACT NO. F49620-93-1-0142

CONTRACT NO. F49620-93-1-0327

PROJECT NO. 2303

PROJECT NO. 3484

TASK NO. DS

TASK NO. YS

MONITOR: AFOSR, XC  
TR-94-0546, AFOSR

MONITOR: AFOSR, XC  
TR-94-0547, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) Elemental parameter sets have been completely developed and validated for sulfur (S), silicon (Si), and phosphorus (P). They are a significant improvement over previous models. Extensive work has been completed on SAM1 parameters for iron (Fe), preliminary results are available. Substantial obstacles have been overcome in the iron work and a clear route to the objective has been established. The theoretical framework is in place and all that is required is completion of the parameterization process. The experience we have gained will allow us to parameterize SAM1 for other transition metals very quickly. The primary question of this research as to whether the Dewar-style semiempirical methodology could be extended to transition metals has been answered in the very definite affirmative. Semiempirical, Transition metals

DESCRIPTORS: (U) \*IRON, \*SULFUR, \*PHOSPHORUS, PARAMETERS, SILICON, TRANSITION METALS, COMPUTATIONS, HEAT OF FORMATION, MOLECULAR ORBITALS, TEST AND EVALUATION.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303DS, SAM1 Computer program

AD-A284 400

UNCLASSIFIED

PAGE 17

T4035K

ABSTRACT: (U) There is strong evidence that objects presented simultaneously in a visual array have their component features initially processed in parallel, then subsequently combined to form the perceived objects. The evidence is in the form of the nature and frequency of perceptual errors and the pattern of reaction times for recognition of presented features and objects. Continuing project research is providing equivalent evidence which demonstrates, for the first time, similar analyses and perceptual processing for auditory events. An important side benefit to the research is the validation of new methods to define the elemental features for the perception of important classes of auditory stimuli. In addition to training future scientists, long-term benefits of the research are (1) in defining important, moderate- and higher-level limits (e.g., beyond masking or sensory acuity) to accurately and rapidly perceiving auditory events (and the sources of the events) under stressful, noisy conditions, and (2) in defining effective strategies for reliably circumventing those newly-identified limits. Auditory Attention, Auditory Features, Feature Integration, Integral, Separable Dimensions

DESCRIPTORS: (U) \*AUDITORY PERCEPTION, ACUITY, ARRAYS, ATTENTION, BENEFITS, ERRORS, FREQUENCY, INTEGRALS,

AD-A284 399

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A284 399 CONTINUED

AD-A284 362 12/5 12/7

INTEGRATION, MASKING, PATTERNS, PROCESSING, REACTION TIME,  
RECOGNITION, SCIENTISTS, STIMULI, STRATEGY, TIME,  
TRAINING, VALIDATION, VISUAL PERCEPTION.

SAM TECHNOLOGY INC SAN FRANCISCO CA

(U) Signet-Software Tools for Signal Identification Using  
Neural Networks.

IDENTIFIERS: (U) PE61103D, WUAFO5R3484YS

DESCRIPTIVE NOTE: Final rept. 1 Mar 89-28 Feb 94,

JUL 94 37P

PERSONAL AUTHORS: Leong, H. M.; Gevins, A. S.

CONTRACT NO. F49620-89-C-0049

PROJECT NO. 3005

TASK NO. A1

MONITOR: AFOSR, XC  
TR-94-0477, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) We are developing a software signal processing workbench named SIGNET that simplifies exploratory analysis of multi-channel time series data. We have demonstrated, for the first time, the feasibility of building a signal-processing system around an object-oriented database (OODB). This provides a graphical means for users to create, compare, and manipulate complex data structures while maintaining system wide understanding of these structures. This understanding enables the system to provide database queries by content, data subset extraction with retention of important relationships. traceable self-documenting data. Insurance that only appropriate data is fed to signal processing functions, etc. The end result is that users have a high degree of flexibility to manipulate data while data integrity and validity is protected. Over the course of the project, we completed a detailed system design, evaluated existing database technologies and chose an OODB upon which to build SIGNET. We built a prototype that implemented the essential framework of SIGNET and provided a platform with which to test the basic technical issues underlying our design. Signal review and exploratory signal analysis software was enhanced for incorporation into the SIGNET framework. We have also tested and analyzed the prototype and have found that the major drawback to our initial design was the speed of system response. The major

AD-A284 399

AD-A284 362

UNCLASSIFIED

PAGE

18

T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A284 362 CONTINUED

AD-A284 257 21/2 7/3 7/6 7/4

factors causing this have been identified and speed-up solutions have been designed. We conclude that OODB technology provides a powerful and appropriate framework to model the data and processes that are used in exploratory multidimensional signal-processing applications. We are determining the commercial viability of developing the prototype into a full commercial system. Signal, Processing, Software, Neural, Networks

DESCRIPTORS: (U) \*NEURAL NETS, \*SIGNAL PROCESSING, \*SOFTWARE ENGINEERING, \*MULTICHANNEL, \*TIME SERIES ANALYSIS, CHANNELS, DATA BASES, EXTRACTION, INSURANCE, MODELS, PLATFORMS, PROTOTYPES, RESPONSE, SIGNALS, TEST AND EVALUATION, TIME, VELOCITY, VIABILITY, COMPUTER NETWORKS.

IDENTIFIERS: (U) WUAFOSR3005A1, PE61102F, OODB(Object Oriented Data Base)

UNITED TECHNOLOGIES RESEARCH CENTER EAST HARTFORD CT

(U) Mechanistic Models of Soot Formation.

DESCRIPTIVE NOTE: Final rept. Jun 91-May 94,

JUL 94 117P

PERSONAL AUTHORS: Colket, Merideth B., III; Hall, Robert J.; Smooke, Mitchell D.

REPORT NO. UTRC-94-28

CONTRACT NO. F49620-91-C-0056

PROJECT NO. 2308

TASK NO.: BS

MONITOR: AFOSR, XC  
TR-94-0519, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) A detailed chemical kinetic mechanism for the pyrolysis of toluene and the formation of polyaromatic hydrocarbons has been developed. This chemical kinetic model is consistent with shock tube data with mass spectral identification of intermediate species. This kinetic analysis provides a better understanding of how aromatic rings decompose and how polyaromatic species grow. In addition, a previously developed soot formation code, based on a sectional aerosol model for predicting soot inception, growth, and oxidation in a premixed flame has been fully integrated into an opposed-jet, diffusion flame code. The new code includes effects due to radiation from both gaseous species and particulates as well as scavenging of species by soot. The code treats particle transport including thermophoresis. Predictions from a low strain rate, lightly-sooting, methane-fueled, opposed-jet, diffusion flame are included in this report. Perturbation studies demonstrate the importance of fully integrating soot production, radiation, and scavenging in order to reasonably predict bulk parameters such as temperature, as well as species concentration, sooting levels and radiation loads. Soot formation modeling, Chemical kinetics of toluene pyrolysis, Formation mechanisms and thermodynamics of polyaromatic

AD-A284 362

AD-A284 257

UNCLASSIFIED

PAGE 19

T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. T4035K

AD-A284 257

CONTINUED

AD-A284 252

20/1

21/5

hydrocarbons, Soot formation in opposed jet flames

CALIFORNIA UNIV DAVIS

DESCRIPTORS: (U) \*MODELS, \*PYROLYSIS, \*SOOT, \*TOLUENES, \*MASS SPECTRA, AEROSOLS, CHEMICALS, DIFFUSION, FLAMES, HYDROCARBONS, IDENTIFICATION, KINETICS, METHANE, OXIDATION, PARAMETERS, PARTICLES, PARTICULATES, PERTURBATIONS, PREDICTIONS, PRODUCTION, RADIATION, RATES, RINGS, SHOCK TUBES, STRAIN RATE, TEMPERATURE, TRANSPORT, TUBES, AROMATIC HYDROCARBONS, POLYMERS, CONCENTRATION(CHEMISTRY).

(U) Measurements of Droplet Dispersion in Heated and Unheated Turbulent Jets.

APR 94 4P

PERSONAL AUTHORS: Call, C. J.; Kennedy, I. M.

CONTRACT NO. F49620-92-J-0418

IDENTIFIERS: (U) PEG1102F, WUAFOSR2308BS, \*Mechanistic, Formation, Premixed, Opposed-jet, Gaseous species, Scavenging, Thermophoresis, Bulk, Polyaromatic

PROJECT NO. 2308

TASK NO. BS

MONITOR: AFOSR, XC  
TR-94-0537, AFOSR

UNCLASSIFIED REPORT

Availability: Pyb. in AIAA Jnl., v32 n4 p874-875, Apr 94.  
Available to DTIC users only. No copies furnished by NTIS.

ABSTRACT: (U) Droplet dispersion and vaporization have been measured in round, turbulent jets of air. The jets were either unheated or heated. Droplets of pentane or hexadecane were created by a piezoelectric generator and injected onto the centerline of the jet. The pentane droplets exhibited a greater dispersion as a function of time as their mass decreased. Droplet diameters were also measured with a slide impaction method. The droplet diameters were shown to deviate considerably from the D2 law. Turbulent spray, Droplet vaporization.

DESCRIPTORS: (U) \*ROCKET ENGINES, \*TURBULENT FLOW, AIR, DIAMETERS, DISPERSIONS, FUNCTIONS, GENERATORS, HEXADECANE, MASS, PENTANES, SPRAYS, TIME, VAPORIZATION.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2308BS, \*Turbulent jets

AD-A284 257

AD-A284 252

UNCLASSIFIED

PAGE

20

T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A284 234 6/5 20/8

AD-A284 234 CONTINUED

ALABAMA UNIV IN BIRMINGHAM

(U) Cumulative Effects of Repeated Brief Cerebral Ischemia.

DESCRIPTIVE NOTE: Final rept..

94 48P

PERSONAL AUTHORS: Hetherington, H. P.; Conger, K. A.

CONTRACT NO. F49620-92-J-0362

PROJECT NO. 2312

TASK NO. BS

MONITOR: AFOSR, XC  
TR-94-0481, AFOSR

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Original contains color plates: All  
DTIC/NTIS reproductions will be in black and white.

ABSTRACT: (U) The purpose of this grant was to investigate the metabolic and physiological factors determining the extent of the ischemic damage in a model of brief repetitive cerebral ischemia. The model is intended to simulate the effects of Gz induced blackout experienced by fighter pilots undergoing high gravitational stress maneuvers. To achieve this goal a rat model was developed whereby the ischemia was remotely induced by inflation (under computer control) of an occlusive cuff placed about the common carotid artery. Metabolic parameters were determined using in vivo NMR spectroscopy measurements throughout the ischemic and reflow periods. Lactate production was found to be highly reproducible and not limited by blood glucose levels. High energy phosphate decreases were correlated with loss of high frequency EEG. To evaluate the correlation between histologic damage and measures of regional metabolism we have carried out 1H spectroscopic imaging experiments with histologic evaluations of the brain three hours after reperfusion. These studies were acquired with 5 minute (2 dimensional mapping across the cortex) and 16 sec time resolution (1 dimensional mapping ) during the ischemia and reflow. Preliminary results of regional clearance kinetics of lactate shows a strong

AD-A284 234

AD-A284 234

UNCLASSIFIED

PAGE 21

T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A284 226 20/4 7/4 12/1

AD-A284 219 5/8

PRINCETON UNIV NJ DEPT OF CHEMICAL ENGINEERING

NEW YORK UNIV MEDICAL CENTER NY

(U) Solute-Solute Interactions: Theory and Simulations,

(U) Measurement and Regulation of Central Noradrenergic Receptors.

94 8P

DESCRIPTIVE NOTE: Annual rept. 1 Dec 92-30 Nov 93,

PERSONAL AUTHORS: Debenedetti, Pablo G.

NOV 93 8P

CONTRACT NO. F49620-93-I-0040

PERSONAL AUTHORS: Stone, Eric A.; Bing, Guoying; Zhang, Yi

PROJECT NO. 2308

TASK NO. BS

CONTRACT NO. F49620-92-J-0084

MONITOR: AFOSR, XC  
TR-94-0536, AFOSR

PROJECT NO. 2312

TASK NO. AS

UNCLASSIFIED REPORT

MONITOR: AFOSR, XC  
TR-94-0505, AFOSR

Availability: Pub. in Supercritical Fluids, p439-445 1994.  
Available only to DTIC users. No copies furnished by NTIS.

UNCLASSIFIED REPORT

ABSTRACT: (U) Fluctuation theory expressions are derived for the solute-solute correlation function integral at infinite dilution. This quantity is predicted to be positive-definite, implying that the corresponding correlation function decays to its bulk value from above at near-critical conditions. A molecular dynamics study of solute-solute collisions in a binary Lennard-Jones system shows no enhancements in the collision rate at near-critical conditions. Supercritical fluids, Solute-solute interactions, Computer simulation, Fluctuation theory, Integral equations.

DESCRIPTORS: (U) \*COLLISIONS, \*SUPERCritical FLOW, \*INTERACTIONS, \*SOLUTES, COMPUTERS, CORRELATION, DILUTION, DYNAMICS, FLUIDS, FUNCTIONS, INTEGRAL EQUATIONS, INTEGRALS, MOLECULAR PROPERTIES, QUANTITY, RATES, SIMULATION, THEORY, REPRINTS, DECAY.

IDENTIFIERS: (U) PE61102F, WUAFOSR2308BS, Fluctuation, Infinite

ABSTRACT: (U) In the past year we have continued our investigation of the relationship between central catecholaminergic systems and the effects of stress. We have completed or made progress in three studies of the role of the noradrenergic system in biochemical and behavioral effects of stress and one study of the role of the dopaminergic system in these behavioral effects. The first noradrenergic study concerned the mechanism of a biochemical response to stress which is believed to play a role in long term stress adaptation, the activation of the immediate early gene, c-fos, in the brain. On the basis of previous data we had hypothesized that the noradrenergic system is involved in the activation of this gene in the brain by stress. In the past year we confirmed this hypothesis by showing that the c-fos mRNA and protein responses to stresses could be reduced by treatment with the beta blocker, propranolol, and enhanced by the norepinephrine (NE) reuptake inhibitor, desmethylimipramine (DMI). These findings have supported a role of the noradrenergic system in adaptational phenomena. The second and third studies concerned the role of noradrenergic processes in two behavioral effects of stress, increased anxiety and motor impairment. In the study on stress-induced anxiety, we found that blockade of beta receptors with propranolol potentiates the

AD-A284 226

AD-A284 219

UNCLASSIFIED

PAGE

22

T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A284 219 CONTINUED

AD-A284 217 20/4 7/4 7/6

stimulatory effect of stress on anxiety in two tests of the latter, passive avoidance and defensive withdrawal.

PRINCETON UNIV NJ DEPT OF CHEMICAL ENGINEERING  
(U) Supercritical Fluids in Particle Formation Media,

DESCRIPTORS: (U) \*STRESS(PHYSIOLOGY), \*NOREPINEPHRINE, \*BEHAVIORAL SCIENCES, ACTIVATION, ADAPTATION, ANXIETY, AVOIDANCE, BRAIN, CATECHOLAMINES, GENES, INHIBITORS, MOTORS, PROTEINS, RECREATION, RESPONSE, STRESSES, TEST AND EVALUATION, RIBONUCLEIC ACIDS.

94 13P

PERSONAL AUTHORS: Debenedetti, Pablo G.

CONTRACT NO. F49620-93-I-0040, \$F49620-93-1-0454

PROJECT NO. 2308

TASK NO. BS

MONITOR: AFOSR, XC  
TR-94-0533, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) Review of advantages, limitations, and relative merits of rapid expansion of supercritical solutions (RESS) and of the supercritical anti-solvent process (SAS) for the formation of particles from supercritical fluids. Emphasis on materials and biomedical applications. Particle formation, Supercritical fluids, Rapid expansion, Anti-solvent process, Polymers, Fibers, Proteins

DESCRIPTORS: (U) \*FLUIDS, \*PARTICLES, \*SUPERCRITICAL FLOW, \*SOLIDS, EXPANSION, FIBERS, LIMITATIONS, MATERIALS, POLYMERS, PROTEINS, SOLVENTS, REPRINTS, MEDIA, COMPOSITE MATERIALS, BIOMEDICINE, MOLECULAR PROPERTIES, PHASE, SEPARATION.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2308BS, \*Formation, Rapid, Antisolvent process

AD-A284 219

AD-A284 217

UNCLASSIFIED

PAGE 23

T4035K



UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A284 216 9/5 20/G.1

AD-A284 216 CONTINUED

WASHINGTON STATE UNIV PULLMAN DEPT OF PHYSICS

DESCRIPTORS: (U) \*FIBER OPTICS, \*OPTICAL SWITCHING, FABRICATION, FIBERS, NONLINEAR OPTICS, OPTICAL WAVEGUIDES, INTERFEROMETERS, LIGHT, OPTIMIZATION, POLYMERS, SWITCHES.

(U) Polymer Fibers for Nonlinear Optics.

DESCRIPTIVE NOTE: Annual rept. 1 May 93-30 Apr 94,

IDENTIFIERS: (U) PE61102F, WUAFOSR2303CS, Information highway.

APR 94 6P

PERSONAL AUTHORS: Kuzyk, Mark G.

CONTRACT NO. F49620-93-1-0255

PROJECT NO. 2303

TASK NO. CS

MONITOR: AFOSR, XC  
TR-94-0499, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The goal of our research is to build an ultrafast all-optical switching device. Such a device would be the first step towards ultrafast switching-systems for the information highway and all-optical computing applications. Our work is motivated by the demonstration of an all-optical switch in a silica optical fiber. While this device displays all essential switching functions, the small material nonlinearity requires fibers of 1 km lengths, resulting in long latency periods. Because we have the ability to make polymer fibers with optical nonlinearities that are three orders of magnitude large, we can make sub-meter length devices. In our first year, we have worked out the preliminaries required to make such a device which includes optimization of the fiber drawing process, characterization of crucial material properties, and the design of optical switches that take advantage of the polymer fiber's nonlinearity. We have demonstrated the fabrication of fibers with cores that are less than 10 micrometers in diameter, have shown that these can support single mode light-guiding (required for optimum device operation), and have designed and built a Sagnac interferometer experiment that is being used to characterize material nonlinearity. This experiment will be eventually converted to an all-optical switch by replacing bulk components with fibers.

AD-A284 216

AD-A284 216

UNCLASSIFIED

PAGE

24

T4035K

## UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A284 215 7/6 20/5

AD-A284 213 9/3 7/2 20/14

MASSACHUSETTS UNIV AMHERST DEPT OF POLYMER SCIENCE AND  
ENGINEERING

ROCKWELL INTERNATIONAL CANOGA PARK CA ROCKETDYNE DIV

(U) AASERT 92 - Synthesis and Properties of Complex  
Polyarylene Vinylenes.

(U) NCL(B) Based Short Wavelength Chemical Laser.

DESCRIPTIVE NOTE: Final rept. 15 Oct 92-14 Feb 94,

DESCRIPTIVE NOTE: Annual rept. 1 Jun 93-31 May 94,

FEB 94 36P

MAY 94 5P

PERSONAL AUTHORS: Yang, T. T.; Gyls, V. T.; Hindy, R. N.

PERSONAL AUTHORS: Karasz, Frank E.

CONTRACT NO. F49620-93-C-0003

CONTRACT NO. F49620-93-1-0396

PROJECT NO. 1601

PROJECT NO. 3484

TASK NO. 08

TASK NO. XS

MONITOR: AFOSR, XC  
TR-94-0475, AFOSRMONITOR: AFOSR, XC  
TR-94-0512, AFOSR

UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

ABSTRACT: (U) The AASERT funding has provided enhanced capabilities in the AFOSR project studying electro-luminescent polymers. In this period conjugated oligomers modified by electro-optically inactive soft blocks have been synthesized. These multi-block conjugated-nonconjugated systems, and their blends, have been incorporated into EL devices and have provided bright, stable, optical emission of predictable colors. As an example poly(1,8-octanedioxy-2,6-dimethoxy-1,4-phenylene-1,2-ethenylene-1,4-phenylene-1,2-ethenylene-1,4-phenylene-3,5-dimethoxy-1,4-phenylene) was synthesized from the appropriate precursor phosphonium salt and dialdehyde. The copolymer product was subsequently isomerized into an all-trans configuration by refluxing in toluene in the presence of a catalytic amount of iodine

DESCRIPTORS: (U) \*COPOLYMERS, \*OLIGOMERS, COLORS, CONFIGURATIONS, EMISSION, IODINE, MIXTURES, TOLUENES, ELECTROLUMINESCENCE, BLOCK POLYMERS, SYNTHESIS(CHEMISTRY), MOLECULAR ISOMERISM, ALDEHYDES, ULTRAVIOLET SPECTROSCOPY, NUCLEAR MAGNETIC RESONANCE.

IDENTIFIERS: (U) PE61103D, WUAFOSR3484XS, Polyarylene vinylenes

AD-A284 215

AD-A284 213

UNCLASSIFIED

PAGE 25

T4035K

ABSTRACT: (U) Based on the results of this work, the prospects of development of a visible chemical laser based on NCl(b) are promising. NCl, in the electronically excited b-state emits to the ground state at 665 nm. The NCl b-state is generated by energy-pooling of NCl(a) and excited iodine atoms I\*. All of these species can be generated from chemical reactions solely. This work has shown that: (1) In the generation of NCl, the branching ratio for NCl(a) is high. 65% of the HN3 ends up in the NCl(a) state; (2) The rate constant for the energy-pooling reaction NCl(a) + I NCl(b) is quite favorably large, approximately 10-11 cu cm/sec; (3) A gain on the order of 1x10(exp 4)/cm was obtained; and (4) Variations of the cavity ring-down experiment showed that virtually no NCl(x) is formed via reaction

DESCRIPTORS: (U) \*CHEMICAL LASERS, \*SHORT WAVELENGTHS, ATOMS, CAVITIES, CHEMICAL REACTIONS, CONSTANTS, ENERGY, GAIN, GROUND STATE, IODINE, LASERS, RATES, RATIOS, RINGS, VARIATIONS, EXCITATION, PHOTONS, NITROGEN, CHLORINE.

IDENTIFIERS: (U) PE63218C, WUAFOSR160108, Branching

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A284 208 12/1 9/1

AD-A284 205 7/4 20/6 7/2 20/2

BOSTON UNIV MA COLL OF ENGINEERING

OKLAHOMA STATE UNIV STILLWATER DEPT OF CHEMISTRY

(U) Geometrical and Topological Methods in Time Domain Antenna Synthesis.

(U) Diffusion of Hydrogen Atoms on a Si(111)-(7x7) Reconstructed Surface: Monte Carlo Variational Phase-Space Theory.

DESCRIPTIVE NOTE: Final rept. 1 Dec 91-30 Apr 94,

JUL 94 11P

APR 94 32P

PERSONAL AUTHORS: Kotiuga, P. R.

PERSONAL AUTHORS: Sorescu, Dan C.; Thompson, Donald L.; Raff, Lionel M.

CONTRACT NO. F49620-92-J-0056

REPORT NO. OSU-1-5-19592

PROJECT NO. 2304

CONTRACT NO. F49620-92-J-0011

TASK NO. BS

PROJECT NO. 2303

MONITOR: AFOSR, XC  
TR-94-0517, AFOSR

MONITOR: AFOSR, XC  
TR-94-0538, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) The nonlinear version of Lorentz Reciprocity cannot be articulated in terms of frequency domain concepts. Similarly, the fact that a Fourier Transform relates an antenna's far field to its sources cannot be used to explain why electromagnetic bullets or missiles cannot exist since, by construction, there is no far field for a bullet. Over the last year it has become clear that one has to deal with Maxwell's Equations as a system of hyperbolic p.d.e.'s and avoid the temptation of using elliptic theory which is applicable when taking a Fourier Transform (as engineers are trained to do) and playing with Helmholtz's equation. The way to achieve these goals is to reexamine the 'raison d'etre' for the use of the Radon transform in these hyperbolic problems.

DESCRIPTORS: (U) \*FREQUENCY DOMAIN, \*ANTENNAS, \*MATHEMATICAL ANALYSIS, CONSTRUCTION, EAR, ENGINEERS, EQUATIONS, FAR FIELD, RADON, SMALL ARMS AMMUNITION, THEORY, ELECTROMAGNETIC PROPERTIES.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304BS

Availability: Pub. in Jnl. of Chemistry and Physics, v101 n2 p1638-1647, 15 Jul 94. Available to DTIC users only. No copies furnished by NTIS.

ABSTRACT: (U) The diffusion of hydrogen atoms on a reconstructed Si(111)-(7x7) surface has been investigated using variational phase-space theory methods. The dimer-atom-stacking (DAS) fault model of the reconstructed Si(111)-(7x7) surface proposed by Takayanagi et al. is employed to describe a four-layer lattice structure containing 292 atoms. The lattice potential is that developed by Bolding and Andersen; the gas-lattice interaction potential is described by a sum of Morse functions and bending terms between the hydrogen adatom and the Si atoms in the first and second layers. Canonical Markov walks with importance sampling are used to evaluate the flux across a set of dividing surfaces separating different adsorption sites. The minimum jump frequencies are then used as input to a set of coupled phenomenological kinetics equations that describe the diffusion rates of adatoms between adjacent adsorption sites. The diffusion coefficients D at different temperatures are computed from the slope of plots of the time variation of the root-mean-square displacements

AD-A284 208

AD-A284 205

UNCLASSIFIED

PAGE

25

T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A284 205 CONTINUED

AD-A284 204 11/4

obtained from the solution of the rate equations. The results at 300, 500, and 800 K yield  $D=0.023 \exp(-1.54 \text{ eV}/kT)$  cm<sup>2</sup>/s. The calculated activation energy of 1.54 eV is in excellent agreement with the experimental results obtained by Reider et al. using an optical second-harmonic diffraction technique. The coordinates corresponding to the minimum energy diffusion path suggest that hydrogen-atom diffusion between atop sites occurs along paths that involve lattice penetration. Calculated upper limits for the tunneling rates at 300, 500, and 800 K show that tunneling processes make only a small contribution to the total diffusion rate

DESCRIPTORS: (U) \*ATOMS, \*DIFFUSION, \*HYDROGEN, \*PHASE, \*SILICON, ACTIVATION ENERGY, ADATOMS, ADSORPTION, BENDING, COEFFICIENTS, COORDINATES, DIFFRACTION, DIMERS, DISPLACEMENT, ENERGY, FAULTS, FREQUENCY, FUNCTIONS, HARMONICS, INPUT, INTERACTIONS, KINETICS, LAYERS, MEAN, MODELS, PATHS, PENETRATION, RATES, SAMPLING, SITES, SLOPE, STACKING, STRUCTURES, SURFACES, TEMPERATURE, THEORY, TIME, TUNNELING, VARIATIONS, YIELD, REPRINTS, MONTE CARLO METHOD, CRYSTAL LATTICES, OPTICS, SURFACE CHEMISTRY.

IDENTIFIERS: (U) \*Reconstructed space

PENNSYLVANIA STATE UNIV UNIVERSITY PARK DEPT OF CHEMISTRY

(U) Fabrication of Biomimetic Molecular Level Composites.

DESCRIPTIVE NOTE: Annual rept. 1 Jun 93-31 May 94,

MAY 94 13P

PERSONAL AUTHORS: Bianconi, Patricia A.

CONTRACT NO. F49620-92-J-0296

PROJECT NO. 2303

TASK NO. DS

MONITOR: AFOSR, XC  
TR-94-0502, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) This report describes development of the chemistry and applications of a new biomimetic in situ synthetic system for the fabrication of inorganic/organic composite materials. The major findings involve understanding the mechanisms of the solid-state syntheses which give rise to composites in which the crystals of the inorganic phase are identical in size, morphology, and crystallographic orientation, the determining characteristics of naturally-formed biological composites. Synthetic control over the morphology and therefore of the material properties of both the organic and inorganic phases of these new materials, as well as the mixing of the two disparate phases on the molecular level, is found to be affected primarily by (1) general factors controlling the crystallization of Cds in polymers, (2) surfactant effects on crystal growth and organization, and (3) matrix effects on crystal growth and organization.

DESCRIPTORS: (U) \*COMPOSITE MATERIALS, \*INORGANIC MATERIALS, \*ORGANIC MATERIALS, CHEMISTRY, CONTROL, CRYSTAL GROWTH, CRYSTALLIZATION, CRYSTALS, FABRICATION, MIXING, MORPHOLOGY, ORGANIZATIONS, PHASE, POLYMERS, SOLIDS, SURFACE ACTIVE SUBSTANCES.

IDENTIFIERS: (U) PE61102F, Biomimetic composites

AD-A284 205

AD-A284 204

UNCLASSIFIED

PAGE 27

T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. T4035K

AD-A284 203 12/9

AD-A284 200 7/4 20/3 20/6 7/2

HARVARD UNIV CAMBRIDGE MA DEPT OF PSYCHOLOGY

COLORADO UNIV AT BOULDER

(U) Cooperativity and 3-D Representation.

(U) Vibrational Specificity for Charge Transfer Versus Deactivation in  $N_2^+(v = 0, 1, 2) + Ar$  and  $O_2$  Reactions,

DESCRIPTIVE NOTE: Final rept. 1 Feb 93-28 Feb 94,

JUL 94 17P

JUL 94 13P

PERSONAL AUTHORS: Cavanagh, Patrick

PERSONAL AUTHORS: Kato, Shuji; Frost, Michael J.; Bierbaum, Veronica M.; Leone, Stephen R.

CONTRACT NO. AFOSR-91-0169

CONTRACT NO. FA9620-92-J-0072

PROJECT NO. 2313

PROJECT NO. 2303

TASK NO. AS

TASK NO. ES

MONITOR: AFOSR, XC  
TR-94-0485, AFOSR

MONITOR: AFOSR, XC  
TR-94-0526, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) Recent evidence indicates that the early stages in visual processing may be broken into several parallel streams that are specialized for the analysis of different visual attributes. A contour localization task showed that all attributes can contribute equally to border localization - no particular attribute dominated position decisions. A series of experiments on transparency perception showed that transparency is analyzed rapidly (within 60 msec) and influences early levels of visual processing. We have also investigated the early stages that lead from the initial 2D representation to object recognition. Visual priming studies have been completed which suggest that object recognition begins, not with the construction of a 3-D model, but with a crude match of 2-D views to internal prototypes. Visual search studies have shown that some scene features may be rapidly suppressed. For example, shadows appear to be identified early and discounted in order to allow object contours to be processed. Finally, long-term practice in visual search tasks leads to learning of both object-centered and retinotopic properties of the stimuli.

DESCRIPTORS: (U) \*CONSTRUCTION, \*CONTOURS, \*COMPUTER VISION, \*THREE DIMENSIONAL, \*IMAGE PROCESSING, INTERNAL, LEARNING, MODELS, PERCEPTION, PROTOTYPES, RECOGNITION, SHADOWS, STIMULI, STREAMS, TRANSPARENCIES.

AD-A284 203

UNCLASSIFIED

PAGE 28 T4035K

Availability: Pub. in Canadian Jnl. of Chemistry, v72 p625-636, 7 Jul 94. Available to DTIC users only. No copies furnished by NTIS.

ABSTRACT: (U) The effect of vibrational excitation on ion-molecule reactions is one of the most fundamental issues of interest in state-selective and state-to-state chemistry, as well as in the chemistry of the upper atmosphere. We recently developed a selected-ion flow tube, laser-induced fluorescence (SIFT-LIF) instrument to study vibrationally state-specific, thermal energy ion-molecule reactions. Here,  $N_2^+(+)$  ions in a mixture of vibrational states are mass selected and injected into a relatively high-pressure He buffer gas. The translational and rotational temperatures of the  $N_2^+(+)$  ions are rapidly thermalized by collisions with He, while the vibrational temperature can be high

DESCRIPTORS: (U) \*CHEMICAL REACTIONS, \*NITROGEN, \*ARGON, \*OXYGEN, \*GASES, \*VIBRATION, \*CHARGE TRANSFER, \*DEACTIVATION, REPRINTS, EXCITATION, ION MOLECULE INTERACTIONS, OPTICS, DETECTION, RESOLUTION, ELECTRONIC STATES, LASER INDUCED FLUORESCENCE, COLLISIONS, ENERGY, THERMAL PROPERTIES, HELIUM.

IDENTIFIERS: (U) WUAFOSR2303ES.

AD-A284 200

## UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A284 199 7/6 6/1 7/3 20/4

AD-A284 198 7/3 7/2 20/5 20/8

PRINCETON UNIV NJ DEPT OF CHEMICAL ENGINEERING

FLORIDA UNIV GAINESVILLE QUANTUM THEORY PROJECT

(U) Precipitation of Poly(L-Lactic Acid) and Composite Poly(L-Lactic Acid)-Pyrene Particles by Rapid Expansion of Supercritical Solutions,

(U) Theoretical Determination of Charge-Transfer and Ligand Field Transition Energies for FeCl<sub>4</sub> - Using the EDM-CCSD Method,

94

22P

94

4P

PERSONAL AUTHORS: Tom, Jean W.; Debenedetti, Pablo G.

PERSONAL AUTHORS: Oliphant, Nevin; Bartlett, Rodney J.

CONTRACT NO. F49620-93-I-0040, F49620-93-1-0454

CONTRACT NO. F49620-92-J-0141

PROJECT NO. 2308

PROJECT NO. 2303

TASK NO. BS

TASK NO. FS

MONITOR: AFOSR, XC

MONITOR: AFOSR, XC

TR-94-0534, AFOSR

TR-94-0529, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

Availability: Pub. in Jnl. of Supercritical Fluids, v7 n1 p9-20, 1994. Available to DTIC users only. No copies furnished by NTIS.

Availability: Pub. in Jnl. of the American Chemical Society, v116 n9 p4091-4092, 1994. Available to DTIC users only. No copies furnished by NTIS.

ABSTRACT: (U) The paper describes the use of rapid expansion of supercritical solutions (RESS) to form bioerodible polymer microparticles, and composite microparticles in which a solute is dispersed in the polymer matrix. The distribution of the solute in the polymer matrix is studied by fluorescence microscopy. Experiments and fluid mechanical calculations are used to identify the transition from microparticles to microspheres. Supercritical fluids, Rapid expansion, Bioerodible polymers, Composite microspheres

ABSTRACT: (U) The electronic structure of FeCl<sub>4</sub> is an important model for ferric active sites, which exist in a large number of proteins and enzymes. FeCl<sub>4</sub> has a high-spin, d<sup>5</sup> electronic configuration in its ground state and a geometric structure in which ligands are arranged around the iron center in (approximately) tetrahedral symmetry. As a model problem for ferric active sites in biological molecules, the theoretical determination of electronic excitation energies and oscillator strengths for FeCl<sub>4</sub> is pertinent to understanding the role played by these active sites in various biological processes

DESCRIPTORS: (U) \*EXPANSION, \*POLYMERS, \*PRECIPITATION, \*SUPERCritical FLOW, DISTRIBUTION, FLUIDS, FLUORESCENCE, MICROSCOPY, MICROSPHERES, SOLUTES, TRANSITIONS, REPRINTS, COMPOSITE MATERIALS, PRECIPITATION, PARTICLES, FLUID MECHANICS, COMPRESSION, DRUGS, CARBON DIOXIDE.

DESCRIPTORS: (U) \*IRON, \*LIGANDS, \*CHARGE TRANSFER, \*TRANSITIONS, \*CHLORIDES, \*ANIONS, \*BIOMOLECULES, CONFIGURATIONS, DETERMINATION, ELECTRONICS, ENZYMES, EXCITATION, GROUND STATE, MODELS, MOLECULES, NUMBERS, OSCILLATORS, PROTEINS, SITES, STRUCTURES, SYMMETRY, REPRINTS, THEORY, ENERGY, ELECTRONIC STATES, SPIN STATES.

IDENTIFIERS: (U) PE61102F, WUAFOSR2308BS, Poly(L-Lactic Acid), RESS(Rapid Expansion of Supercritical Solutions), Bioerodible, Poly(Hydroxy Acids), \*Pyrenes

IDENTIFIERS: (U) PE61102F, WUAFOSR2303FS, Tetrahedral, EOM(Energy of Motion), CC(Coupled Cluster), High Spin

AD-A284 199

AD-A284 198

UNCLASSIFIED

PAGE 29

T4035K



UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A284 197 20/4

AD-A284 196 12/5

CALIFORNIA INST OF TECH PASADENA GRADUATE AERONAUTICAL LABS

PRINCETON UNIV NJ DEPT OF MECHANICAL AND AEROSPACE ENGINEERING

(U) Hypervelocity Flow simulation.

(U) Study of a Navier-Stokes Computer.

JUN 94 8P

DESCRIPTIVE NOTE: Final rept. 1 Feb 92-31 Jan 94,

PERSONAL AUTHORS: Hornung, Hans; Wen, Chihyung; Germain, Patrick

JUL 94 6P

PERSONAL AUTHORS: Nosenchuck, Daniel

CONTRACT NO. F49620-93-1-0338

CONTRACT NO. F49620-92-J-0151

PROJECT NO. 3484

PROJECT NO. 2307

TASK NO. AS

TASK NO. AS

MONITOR: AFOSR, XC  
TR-94-0527, AFOSR

MONITOR: AFOSR, XC  
TR-94-0489, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

Availability: Pub. in Applied Mechanics Review, v47 n6 pt2 pS14-S19, Jun 94. Available to DTIC users only. No copies furnished by NTIS.

ABSTRACT: (U) Many of the flow problems associated with flight vehicles designed to reach or return from space cannot be solved computationally. It is essential to address them by experiment, in particular, by ground simulation of the flow. The requirements and most successful simulation techniques are described, and their important limitations are discussed. Two selected examples are then presented from the free-piston reflected shock tunnel T5 at Caltech: Dissociating flow over spheres and transition from laminar to turbulent flow on a slender cone. Ground simulation, Hypervelocity, Shock tunnel, Transition blunt body flows

DESCRIPTORS: (U) \*SHOCK TUNNELS, \*FLIGHT SIMULATION, BLUNT BODIES, FLIGHT, FLOW, LIMITATIONS, PISTONS, REQUIREMENTS, SHOCK, SPHERES, TRANSITIONS, TURBULENT FLOW, VEHICLES, PROBLEM SOLVING, REPRINTS.

IDENTIFIERS: (U) PEG1103D, WUAFOSR3484AS, \*Hypervelocity flow

ABSTRACT: (U) During the past year, research has progressed along three fronts: (1) Development of a high-performance FORTRAN compiler for the Navier-Stokes Computer (NSC); (2) Identification of appropriate application codes; and (3) Study of an upgrade to the NSC architecture and hardware to produce a next-generation node

DESCRIPTORS: (U) \*COMPILERS, \*COMPUTERIZED SIMULATION, FORTRAN, COMPUTER ARCHITECTURE, NODES, PROTOTYPES, TURBULENT BOUNDARY LAYER, BOUNDARY LAYER FLOW, ELECTRICAL CONDUCTIVITY.

IDENTIFIERS: (U) WUAFOSR2307AS

AD-A284 197

AD-A284 196

UNCLASSIFIED

PAGE

30

T4035K



UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A284 194 7/6 20/5 7/2 20/3 AD-A284 194 CONTINUED

MASSACHUSETTS INST OF TECH CAMBRIDGE DEPT OF CHEMISTRY

(U) Large Amplitude Motions, Especially Isomerization and Tunneling in Polyatomic Molecule Spectra: Novel Experimental, Pattern Recognition, and Theoretical Methods.

DESCRIPTIVE NOTE: Final rept. 1 Nov 90-31 Oct 93,

JUL 94 23P

PERSONAL AUTHORS: Field, Robert W.; Silbey, Robert J.

REPORT NO. 3

CONTRACT NO. AFOSR-91-0079

PROJECT NO. 2303

TASK NO. B1

MONITOR: AFOSR, XC  
TR-94-0479, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) Stimulated Emission Pumping (SEP) spectra of HCP imply surprisingly regular dynamics for a rigid molecule undergoing up to 300 deg bending vibrations. Optical Optical Double Resonance (OODR) spectra characterize corresponding ( $\pi^*$  squared reversing  $\pi$  squared) doubly excited (predissociated) states of HCP and HCCH. The factors governing intensities of nominally forbidden transitions in bent yielding linear SEP spectra are analyzed; this analysis forces the conclusion that transitions into excited CH stretching levels are absent from the A ( $\tilde{t}$ ide)-X( $\tilde{t}$ ide) SEP spectra of HCN and HCCH. All mystery transitions in Wodtke's SEP spectra of HCN are assigned. An OODR scheme has been devised for distinguishing electric dipole from magnetic dipole transitions

DESCRIPTORS: (U) \*ISOMERIZATION, \*TUNNELING, \*AMPLITUDE, \*MOTION, \*POLYATOMIC MOLECULES, \*SPECTRA, ENERGY LEVELS, ENERGY TRANSFER, ACETYLENE, SPECTROSCOPY, PATTERN RECOGNITION, EMISSION, THEORY, EXPERIMENTAL DESIGN, PUMPING, DYNAMICS, MOLECULES, BENDING MOMENTS, SURFACES, BARRIERS, OPTICS, VIBRATION, RESONANCE, MOLECULAR

AD-A284 194

UNCLASSIFIED

PAGE 31

T4035K

PROPERTIES, EXCITATION, TRANSITIONS, INTENSITY, CARBON, ROTATION, HYDROGEN, GROUND STATE, LASERS, DIPOLE MOMENTS, ELECTRICAL PROPERTIES, COLLISIONS, POTENTIAL ENERGY, SYMMETRY, SELECTION RULES(PHYSICS).

IDENTIFIERS: (U) PEG1102F, WUAFOSR2303B1, SEP(Stimulated Emission Pumping), Chemical physics, OODR(Optical Optical Double Resonance), Intramolecular, HCP Spectroscopy, Electron states

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A284 193 8/7 8/8 24/4 AD-A284 193 CONTINUED

KANSAS STATE GEOLOGICAL SURVEY LAWRENCE

(U) Characterization of Heterogeneities Controlling Transport and Fate of Pollutants in Unconsolidated Sand and Gravel Aquifers: Third Year Report.

DESCRIPTIVE NOTE: Annual technical rept. 1 Jun 93-31 May 94,

JUN 94 236P

PERSONAL AUTHORS: McElwee, Carl D.; Butler, James J., Jr.; Macpherson, Gwendolyn L.; Bohling, Geoffrey C.; Mennicke, Christine M.

REPORT NO. KGS-OFR-94-32

CONTRACT NO. AFOSR-91-0298

PROJECT NO. 3484

TASK NO. D7

MONITOR: AFOSR, XC  
TR-94-0474, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The purpose of this project is to evaluate promising methodologies for characterization of heterogeneities in hydraulic conductivity. The major thrusts of this year's work were an assessment of well tests in heterogeneous formations and preparation for a series of induced-gradient tracer tests. The theoretical components of this effort included development of a general model for slug tests in partially penetrating wells, an assessment of the viability of conventional slug-test methods, modeling investigations of pulse tests in heterogeneous formations, and an analysis of appropriate designs for a tracer-test monitoring well array. The field component of this work emphasized slug tests. Practical guidelines for the design, performance, and analysis of slug tests, which should considerably improve the quality of resulting parameter estimates, have been proposed. A unified slug-test model incorporating the effects of nonlinearities, inertia, viscosity, changing casing radii, and velocity distributions has been developed to explain anomalous

data from wells in formations of high hydraulic conductivity. Additional field work included drilling and sampling activities; laboratory analysis of sampled cores; an aqueous geochemistry study; construction and installation of multilevel sampling wells; and experimentation with a new single-well tracer test method. Overall, the research of year three reduced results of considerable practical significance. Heterogeneities, Alluvial aquifers, Slug tests, Site characterization, Pollutant transport, Pulse testing

DESCRIPTORS: (U) \*AQUIFERS, \*HYDRAULICS, ARRAYS, CONSTRUCTION, CORES, SAND, ALLUVIUM, WATER WELLS, FIELD TESTS, DISTRIBUTION, DRILLING, ESTIMATES, GEOCHEMISTRY, GRADIENTS, SEDIMENT TRANSPORT, INERTIA, STRATIGRAPHY, WATER POLLUTION, SITE INVESTIGATIONS, MONITORING, PARAMETERS, POLLUTANTS, PREPARATION, SAMPLING, SITES, TEST AND EVALUATION, VELOCITY, VIABILITY, VISCOSITY.

IDENTIFIERS: (U) WUAFOSR3484D7, Slug tests, GEMS(Geohydrologic Experimental and Monitoring Site)

AD-A284 193

AD-A284 193

UNCLASSIFIED

PAGE

32

T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A284 192 12/3 12/1 AD-A284 192 CONTINUED

MINNESOTA UNIV MINNEAPOLIS INST FOR MATHEMATICS AND ITS APPLICATIONS

(U) Finite Markov Chains and Random Discrete Structures.

DESCRIPTIVE NOTE: Final rept. 15 Oct 93-14 Apr 94.

JUL 94 5P

PERSONAL AUTHORS: Friedman, Avner; Miller, Willard, Jr

REPORT NO. IMA-1

CONTRACT NO. F49620-94-1-0009

PROJECT NO. 2304

TASK NO. ES

MONITOR: AFOSR, XC  
TR-94-0520, AFOSR

publication of the technical research reports submitted by the workshop participants for inclusion in the IMA Preprint Series, and two IMA Proceedings Volumes. Random discrete structures, Theoretical computer science, Bayesian statistics, Classification probability, Markov chains, Jung's work on synchronicity, Random graphs, Random permutations

DESCRIPTORS: (U) \*MARKOV PROCESSES, CLASSIFICATION, COMPUTATIONS, DISCRETE DISTRIBUTION, GRAPHS, INCLUSIONS, INTEGRALS, APPROXIMATION(MATHEMATICS), METHOD OF MOMENTS, PARAPSYCHOLOGY, PERMUTATIONS, PROBABILITY, RUNGE KUTTA METHOD, NONLINEAR ANALYSIS, RANDOM WALK, PHASE TRANSFORMATIONS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304ES

# UNCLASSIFIED REPORT

ABSTRACT: (U) This grant from the Air Force Office of Scientific Research supported the research related to the two IMA Workshops Finite Markov Chain Renaissance held on October 18-22, 1993 and Random Discrete Structures held on November 15-19, 1993. The first workshop was organized by Persi Diaconis and David Aldous, while the second one by David Aldous and Robin Pemantle. Both workshops were integral parts of the IMA 1993-1994 year-long program on 'EMERGING APPLICATIONS OF PROBABILITY'. The October workshop addressed the following issues: Theoretical computer science examples: successes and open problems; computation-Bayesian statistics; Classical probability examples: successes and open problems; Mathematical theory and other aspects of Markov Chains. The November workshop explored examples from Jung's work on synchronicity to recent studies of parapsychology; random graphs; random permutations and Stein's method. In addition this workshop addressed new questions concerning probability on discrete infinite structures. The services of J. Michael Steele, a senior fellow was partially supported by this grant. Steele provided over-all direction for the entire probability program. Similarity, the grant supported 8 one-month visitors and 21 workshop participants. Grant AF/F49620-94-1-009 also supported the

AD-A284 192

UNCLASSIFIED

PAGE 33

T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A284 191 CONTINUED

FLORIDA INST OF TECH MELBOURNE DEPT OF ELECTRICAL AND  
COMPUTER ENGINEERING

(U) Phase and Amplitude Controlled Micropatch Antenna.

DESCRIPTIVE NOTE: Final technical rept. 1 Apr 93-31 Mar  
94,

JUL 94 8P

PERSONAL AUTHORS: Thursby, Michael H.

REPORT NO. ASL-94-001

CONTRACT NO. F49620-93-1-0286

PROJECT NO. 2304

TASK NO. HS

MONITOR: AFOSR, XC  
TR-94-0521, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) As the wireless communications industry in the U.S. stands poised for an explosion of new commercial and military applications (e.g. the Radio Mall, the Airlink), reducing the high cost of phased array antennas becomes ever more important. Reducing these antenna costs is the primary objective of this research. We will describe an effort that to date has produced a working prototype of a micropatch antenna incorporating a single dollar per bit phase shifter. Since 1987, when we have been involved in designing antenna systems using micropatch elements, early work led to our discovery of the Smart Electromagnetic Structure concept which resulted in the development of a neural controlled, frequency agile antenna element capable of following the frequency of incoming radiation, and tuning the antenna center frequency to that of the incoming signal. This can be applied to systems like frequency-hop radios. In this paper we will describe a method of controlling a micropatch antenna to provide phase only variation of the antenna characteristics using a similar device to that used for the frequency control experiments. We have successfully varied the phase of the antenna element without significantly changing the operating frequency.

AD-A284 191

UNCLASSIFIED

AD-A284 191

PAGE

34 - T4035K

This work has led us to pursue further the design and fabrication of an array of such phase adjustable element to test the hypothesis that such phase controlled micropatch elements can be used to fabricate a low cost phased array antenna. MicroStrip antennas, Frequency agile, Phase shift, Tuning, Varactors, Phased arrays, Adaptive antennas.

DESCRIPTORS: (U) \*PHASED ARRAYS, \*ANTENNA ARRAYS, \*COMMUNICATION AND RADIO SYSTEMS, \*NEURAL NETS, \*ANTENNA RADIATION PATTERNS, ANTENNAS, ARRAYS, CONTROL, COSTS, FABRICATION, FREQUENCY, MILITARY APPLICATIONS, PHASE SHIFT, PROTOTYPES, RADIO EQUIPMENT, TEST AND EVALUATION, TUNING, VARACTOR DIODES, RADIO SIGNALS.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2304HS, Frequency hopping, Microstrip antennas

UNCLASSIFIED

AD-A284 189 6/4 20/1 25/4 DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K  
AD-A284 189 CONTINUED

INDIANA UNIV AT BLOOMINGTON HEARING AND COMMUNICATION LAB

(U) Perception of Complex Auditory Patterns.

DESCRIPTIVE NOTE: Annual rept. 15 Sep 92-14 Sep 93,

SEP 93 16P

PERSONAL AUTHORS: Watson, Charles S.

CONTRACT NO. F49620-92-J-0506

PROJECT NO. 2313

TASK NO. AS

MONITOR: AFOSR, XC  
TR-94-0503, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) This report describes research progress in three areas: the perception of complex sounds, including tonal sequences and bursts of frozen gaussian noise; models for the discrimination of complex sounds; and the perception of speech sounds, under various degrees of stimulus uncertainty and levels of training. Major accomplishments during this period include: the finding that the ability to detect very small frequency changes in single components of tonal sequences, previously assumed to be accomplished only after lengthy training on the specific discrimination task in question, is largely the result of familiarity with the stimulus and is relatively independent of the manner in which that familiarity was acquired; the previously described PTD rule for auditory pattern discrimination predicts the discrimination of changes in temporal as well as spectral properties of patterns, and a new model of auditory pattern discrimination that combines elements of Jeffress leaky integrator and the Durlach-Braida equalization-cancellation models is quite successful in describing the results of noise-burst discrimination experiments, including the PTD phenomena mentioned above.

DESCRIPTORS: (U) \*AUDITORY PERCEPTION, \*SOUND PITCH, \*GAUSSIAN NOISE, EQUALIZATION, FREQUENCY, HEARING, AUDIO TONES, PATTERNS, RUPTURE, STIMULATION(PHYSIOLOGY), SPEECH RECOGNITION, SEQUENCES, UNCERTAINTY, PITCH DISCRIMINATION.

AD-A284 189

UNCLASSIFIED

AD-A284 189

PAGE 35

T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A284 185 20/5 7/4 12/1 AD-A284 174 6/4 6/5 6/1

PRINCETON UNIV NJ DEPT OF CHEMICAL ENGINEERING

SRI INTERNATIONAL MENLO PARK CA

(U) Integral Equation Study of Microstructure and Solvation in Model Attractive and Repulsive Supercritical Mixtures.

93 12P

PERSONAL AUTHORS: Tom, Jean W.; Debenedetti, Pablo G.

CONTRACT NO. F49620-93-1-0040

PROJECT NO. 2308

TASK NO. BS

MONITOR: AFOSR, XC  
TR-94-0535, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in I&EC Research, v32 n9 p2118-2128, 1993. Available to DTIC users only. No copies furnished by NTIS.

ABSTRACT: (U) Integral equation calculations are used to study molecular distribution functions in model attractive and repulsive supercritical solutions. The size of the solvation region is found to range from 3 to 5 solvent diameters. Pronounced microstructural differences are obtained between attractive (nonvolatile solute) and repulsive (volatile solute) mixtures, the latter exhibiting correlation holes. Molecular interactions, Supercritical mixtures, Supercritical fluids, Attractive, Repulsive, Integral equations

DESCRIPTORS: (U) \*MOLECULE MOLECULE INTERACTIONS, \*INTEGRAL EQUATIONS, \*SOLVATION, DISTRIBUTION FUNCTIONS, SOLUTIONS(MIXTURES), MICROSTRUCTURE, QUANTITATIVE ANALYSIS, CORRELATION TECHNIQUES, INTERACTIONS, SOLUTES, SPATIAL DISTRIBUTION, REPRINTS, SOLVENTS.

IDENTIFIERS: (U) \*Supercritical mixtures

AD-A284 185

UNCLASSIFIED

PAGE 38 T4035K

(U) In Vitro System for Studying Metabolism of Environmental Chemicals in Human Cells.

DESCRIPTIVE NOTE: Annual rept. 30 Apr 93-29 Apr 94,

JUL 94 24P

PERSONAL AUTHORS: Green, Carol E.

CONTRACT NO. F49620-91-C-0050

PROJECT NO. 2312

TASK NO. AS

MONITOR: AFOSR, XC  
TR-94-0508, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The objective of the project is to establish and use an in vitro liver model from rodents and humans to develop quantitative data on the metabolism of toxic chemicals. In the third year of the project, liver slices from rat and human liver were compared to evaluate their capacity for chloroform metabolism. It was observed that the weight (an indication of the slice thickness) of the liver slices was inversely related to the rate of chloroform metabolism, suggesting that metabolism was limited by diffusion into the tissue in the thicker slices. Using the thinnest slices possible, the kinetic constants for chloroform metabolism by rat and human liver slices were determined. The V max values for chloroform metabolism were  $2.82 \pm 0.79$  nmol/min/g tissue and  $2.91 \pm 0.99$  nmol/min/g tissue, with rat and human liver, respectively and the K values were  $25.5 \pm 18.4$  nmol/flask and  $8.33 \pm 1.9$  nmol/flask, rat and human liver, respectively. Rat hepatocytes incubated under similar conditions metabolized chloroform with a V max of 10 nmol/min/g and a K of 93 nmol/flask. In summary, the liver slice system was readily adaptable to investigation of the metabolism of volatile chemicals.

DESCRIPTORS: (U) \*LIVER, \*METABOLISM, \*IN VITRO ANALYSIS, CHEMICALS, CHLOROFORM, CONSTANTS, DIFFUSION, FLASKS, HUMANS, KINETICS, MODELS, RATES, RATS, RODENTS, THICKNESS,

AD-A284 174

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A284 174 CONTINUED

AD-A284 172 6/4 6/15

VALUE, WEIGHT, CELLS, TOXICOLOGY, GAS CHROMATOGRAPHY.

MONTANA STATE UNIV BOZEMAN DEPT OF CHEMISTRY

IDENTIFIERS: (U) PE61102F, WUAFOSR2312AS, Hepatocytes

(U) Aldehydic Products of Lipid Peroxidation in the Retina  
Generated by Environmental Toxins.

DESCRIPTIVE NOTE: Annual rept. 1 Jan-31 Dec 94,

DEC 94 5P

PERSONAL AUTHORS: Van Kuijk, F. J.

CONTRACT NO. F49620-94-1-0082

MONITOR: AFOSR, XC  
TR-94-0497, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The synthesis of stable isotope internal standards of 4-hydroxyalkenals for quantitative mass spectrometry has been improved to a routine procedure. The standards work well in the assay employed, when 4-hydroxyalkenals were quantitated in oxidized human low density protein. Xanthin oxidase was localized in the capillary endothelium cells in bovine and human retina. Inhibition of ATPase with 4-hydroxynonenal was shown to be due in part to interaction with cysteine and lysine residues. The activity could not be completely restored using B-mercaptoethanol and hydroxylamine. Peptide maps have been obtained of rhodopsin modified with 4-hydroxynonenal, and these are being further characterized using time of flight mass spectrometry. Experiments on photolysis of human rhodopsin will focus on the Meta II to Meta III equilibrium.

DESCRIPTORS: (U) \*EYE PIGMENTS, \*RETINA, \*TOXINS AND ANTIPOXINS, \*LIPIDS, \*VISION, BOVINES, CELLS, CYSTEINE, DENSITY, ENDOTHELIUM, FLIGHT, HUMANS, INHIBITION, INTERACTIONS, INTERNAL, LOW DENSITY, MAPS, MASS SPECTROMETRY, OXIDOREDUCTASES, PEPTIDES, PHOTOLYSIS, PROTEINS, RESIDUES, STABLE ISOTOPES, STANDARDS, SYNTHESIS, TIME, WORK, ENVIRONMENTAL TESTS, ALDEHYDES, FREE RADICALS.

IDENTIFIERS: (U) WUAFOSR2312AS, PE61102F.

AD-A284 174

AD-A284 172

UNCLASSIFIED

PAGE 37

T4035K



UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A284 171 7/4 7/5 20/5 AD-A284 171 CONTINUED

TENNESSEE UNIV KNOXVILLE DEPT OF CHEMISTRY

EXOTHERMIC REACTIONS.

(U) Electrochemical and Spectroscopy Studies of Selected Inorganic and Organic Systems in Molten Halides.

IDENTIFIERS: (U) PEG1102F, WJAFDSR2303AS, Methylanthracene

DESCRIPTIVE NOTE: Annual rept. 15 Feb 93-14 Feb 94,

FEB 94 43P

PERSONAL AUTHORS: Mamantov, Gleb

CONTRACT NO. F49620-93-1-0129

PROJECT NO. 2303

TASK NO. AS

MONITOR: AFOSR, XC  
TR-94-0496, AFOSR

UNCLASSIFIED REPORT

**ABSTRACT:** (U) The research during the past year has concentrated on the photochemistry of anthracene and 9-methylanthracene in molten aluminum chloride-1-ethyl-3-methylimidazolium chloride (AlCl<sub>3</sub>/EMIC), looking in particular for photoinduced electron transfer reactions. Several such reactions have been found. Experiments demonstrate that this chemistry was initiated by electron transfer from the excited state of 9-methylanthracene to EMI+. The difference in behavior of anthracene and 9-methylanthracene in the basic melt can be attributed to the difference in the rate of electron transfer to EMI+; for anthracene, the electron transfer is endothermic and slow, while for 9-methylanthracene, the electron transfer is exothermic and fast. Irradiation of anthracene in oxygenated basic medium afforded several products including 9-chloranthracene. Although the formation of 9-chloranthracene can be envisioned to arise by electron transfer from the excited state of anthracene to O<sub>2</sub>, additional work will be required to prove that this assumption is correct.

**DESCRIPTORS:** (U) \*ELECTROCHEMISTRY, \*PHOTOCHEMICAL REACTIONS, \*ANTHRACENES, HALIDES, CHLORIDES, OXIDATION, EXCITATION, ELECTRON TRANSFER, MOLTEN SALTS, ALUMINUM COMPOUNDS, RAMAN SPECTROSCOPY, ELECTRON SPIN RESONANCE, ULTRAVIOLET SPECTROSCOPY, ENDOTHERMIC REACTIONS.

AD-A284 171

AD-A284 171

UNCLASSIFIED

PAGE

38

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UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A284 170 7/3 6/1

AD-A284 170 CONTINUED

TENNESSEE UNIV KNOXVILLE CENTER FOR ENVIRONMENTAL BIOTECHNOLOGY

(U) Molecular Probes and Bioluminescent Reporters in Ecological Optimization of Biodegradation. (FY 91 AASERT).

DESCRIPTIVE NOTE: Annual rept. 1 Jun 93-31 May 94,

MAY 94 4P

PERSONAL AUTHORS: Sayler, G. S.

CONTRACT NO. F49620-92-J-0333

PROJECT NO. 3484

TASK NO. S4

MONITOR: AFOSR, XC  
TR-94-0494, AFOSR

UNCLASSIFIED REPORT

**ABSTRACT:** (U) The goal of the research supported by this grant is to determine the role that biosurfactants and synthetic surfactants play in enhancing the bioavailability of sorbed or immiscible-phase aromatic hydrocarbons (PAHs.) in particulate media. Increased bioavailability is assessed in terms of increased PAH-degrader population densities (nah gene frequencies) and their activities including the rate and/or extent of biodegradation and degradative gene expression as measured by bioluminescence response and mRNA levels. To achieve the proposed goal, bacterial strains containing specific degradative genes and bioluminescent reporter systems are being used to monitor the effectiveness of surfactants for enhancing the biodegradation of aromatic hydrocarbon contaminants in environmental simulations. These genetic marker systems allow for the quantitation of degradative gene frequency and activity. Construction of an improved bioluminescent reporter strain for PAH degradation is currently underway. This approach involves incorporation of a transposon containing the lower naphthalene pathway promoter fused to the lux genes (nah-lux) into the bacterial chromosome resulting in a stable gene fusion present as a single copy per cell.

AD-A284 170

AD-A284 170

UNCLASSIFIED

PAGE

39

T4035K

DESCRIPTORS: (U) \*AROMATIC HYDROCARBONS, \*BIODETERIORATION, \*BIOLUMINESCENCE, APPROACH, CELLS, CHROMOSOMES, CONSTRUCTION, CONTAMINANTS, DEGRADATION, DENSITY, FREQUENCY, GENES, GENETICS, GRANTS, MARKERS, MEDIA, MONITORS, NAPHTHALENES, PARTICULATES, PHASE, POPULATION, RATES, RECREATION, RESPONSE, SIMULATION, SURFACE ACTIVE SUBSTANCES, ECOLOGY, OPTIMIZATION, SYNTHETIC MATERIALS, ENVIRONMENTS, MICROBIOLOGY.

IDENTIFIERS: (U) WUAFOSR3484S4, PE61103D

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. T4035K

AD-A284 169 11/4 11/6.1

AD-A284 168 7/6 7/1

CALIFORNIA UNIV IRVINE DEPT OF MECHANICAL AND AEROSPACE  
ENGINEERING

CINCINNATI UNIV OH DEPT OF CHEMISTRY

(U) High Temperature Fracture Mechanisms in Metallic  
Matrix Composites Produced by Solidification  
Techniques.

(U) Novel Polymeric Composites Through Molecular  
Engineering.

DESCRIPTIVE NOTE: Annual rept. 1 Jul 93-30 Jun 94,

DESCRIPTIVE NOTE: Final rept. 1 Sep 90-28 Feb 94,

JUN 94 7P

92 52P

PERSONAL AUTHORS: Mark, James E.

PERSONAL AUTHORS: Earthman, James C.; Lavernia, Enrique J.

CONTRACT NO. F49620-92-J-0322

CONTRACT NO. AFOSR-90-0366

PROJECT NO. 2303

PROJECT NO. 3484

TASK NO. CS

TASK NO. S2

MONITOR: AFOSR, XC  
TR-94-0493, AFOSR

MONITOR: AFOSR, XC  
TR-94-0482, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) Basic studies of solidification processing and high temperature deformation that have a critical effect on fracture in intermetallic materials have been conducted. A study was undertaken with the objective of assessing the correlation between point counting, image analysis and acid analysis, for the determination of the volume fraction of particulate reinforcement in MMCs. In order to illustrate the effects of reinforcement and matrix composition on the results, two different matrices (Al and Ni3Al) and two types of reinforcing particulates (SiC and TiB2) were selected for the present study. High temperature fracture, Metal matrix composites, Solidification processing

DESCRIPTORS: (U) \*DEFORMATION, \*METAL MATRIX COMPOSITES, CORRELATION, HIGH TEMPERATURE, IMAGES, PARTICULATES, PROCESSING, SOLIDIFICATION, ALUMINUM ALLOYS, TITANIUM ALLOYS, CRACKING(FRACTURING), RUPTURE, NICKEL INTERMETALLICS, REINFORCING MATERIALS, MICROSTRUCTURE, CREEP, STRESS ANALYSIS.

IDENTIFIERS: (U) PE61103D, WUAFOSR3484S2.

AD-A284 169

AD-A284 168

UNCLASSIFIED

PAGE #0

T4035K

ABSTRACT: (U) Some final studies during this period were carried out in collaboration with Wright-Patterson AFB. They were based on some benzoxazole copolymers of good thermo-oxidative stability and solubility in tetrahydrofuran. The hydroxypolybenzoxazoles employed were reacted with an isocyanatosilane coupling agent and the hybrid consequently with in-situ produced silica. The resulting hybrid films containing one third silica were transparent. The mechanical properties of the hybrid materials were highly dependent on the nature of the organic polymers. In general, the tensile modulus of the hybrid materials increased with addition of silica but, as in the case of the polyamides, the elongation at break decreased at higher silica contents. Future work will focus on new polymers, additional physical properties, and new processing techniques. The new polymers will include benzoxazole polymers being prepared at Wright-Patterson AFB with structural changes to improve tractability and alternative functional groups to improve bonding to ceramic phases. Examples of new physical properties of importance are thermal expansion coefficients and impact strengths. New processing techniques to be sought include methods for densifying cameras prepared from glassy polymers such as poly(methyl methacrylate), and preparing organic-inorganic aerogels by supercritically drying some of the hybrid composites

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. T4035K

AD-A284 168 CONTINUED

AD-A284 167

6/4

5/8

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MASSACHUSETTS GENERAL HOSPITAL BOSTON

DESCRIPTORS: (U) \*BENZOXAZOLES, \*COPOLYMERS, \*SYNTHESIS(CHEMISTRY), BONDING, DRYING, ELONGATION, FILMS, MECHANICAL PROPERTIES, METHACRYLATES, PROCESSING, SOLUBILITY, STABILITY, THERMAL EXPANSION, OXIDATION, SILANES, COUPLING(INTERACTION), POLYAMIDE, PLASTICS, SILICA GELS, PREPARATION, PHASE STUDIES.

(U) Cellular Analysis of Circadian Rhythmicity in Cultured SCN Neurons.

DESCRIPTIVE NOTE: Annual rept. 1 Jul 93-31 Jul 94,

JUL 94 4P

IDENTIFIERS: (U) PE61102F, WUAFOSR2303CS, APTMOS(Aminophenyltrimethoxysilane), Hybrid organic inorganic composites

PERSONAL AUTHORS: Reppert, Steven M.; Welsh, David K.

CONTRACT NO. F49620-93-1-0434

PROJECT NO. 2312

TASK NO. CS

MONITOR: AFOSR, XC  
TR-94-0495, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) Circadian rhythms are generated by brain cells located in the suprachiasmatic nuclei (SCN) of the mammalian hypothalamus, but it is not clear how individual cells contribute to the operation of the circadian clock. SCN neurons dissociated from newborn rat SCN were characterized by immunocytochemistry and by patch recording of spontaneous action potentials and synaptic currents. Inhibitory synaptic interactions were prevalent among neurons, increasing progressively with time in culture. Evidence was found for presence of gap junctions between glial cells but not between neurons. To assess circadian rhythmicity, long-term multielectrode recordings of spontaneous action potentials were obtained from neurons cultured for 1-6 wks on Glass plates containing a flat array of 61 microelectrodes. Firing rates of some but not all individual neurons exhibited clear circadian rhythms with periods of nearly 24 hrs. Within a culture, cells expressing circadian rhythms showed no short-term firing synchrony. The phase of the circadian rhythm varied among cultures and, in most cases, among different cells within the same culture. With the ability to record circadian rhythms from individual SCN neurons, experimental analysis can now proceed to detailed study of circadian pacemaker neurons and their interactions. Circadian Rhythms.

AD-A284 168

AD-A284 167

UNCLASSIFIED

PAGE

41

T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. T4035K

AD-A284 167 CONTINUED

AD-A284 166 12/9 12/3

DESCRIPTORS: (U) \*CIRCADIAN RHYTHMS, \*NERVE CELLS,  
\*NUCLEI, ARRAYS, BRAIN, CELLS, CLOCKS, CULTURES(BIOLOGY),  
GLASS, HYPOTHALAMUS, INFANTS, INTERACTIONS, JUNCTIONS,  
OPERATION, PACEMAKERS, PHASE, PLATES, RATES, RATS,  
RECORDS, TIME, MAMMALS.

NEBRASKA UNIV LINCOLN

(U) A New Multi-Dimensional Transform for Digital Signal  
Processing Using Generalized Association Schemes.

DESCRIPTIVE NOTE: Final annual rept. 1 Jun 92-31 May 94,

IDENTIFIERS: (U) SCN(Suprachiasmatic Nuclei).

MAY 94 19P

PERSONAL AUTHORS: Bhattacharya, Prabir

PROJECT NO. 2304

TASK NO. ES

MONITOR: AFOSR, XC  
TR-94-0490, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) Our research focused on the development of a multi-dimensional discrete transform using a new algebra of multi-dimensional arrays. The proposed transform for the n-dimensional can compute and block the transforms of a family of (n-1) dimensional arrays. Also, the number of multiplications is relatively low. The definition of the transform (for the 3-dimensional case) uses the concept of an inverse pair for a pair of 3-dimensional arrays. We have developed methods to compute such inverse pairs and it has been shown there is an abundant supplies of such pairs which could then profitably be used to define various types of 3-dimensional transforms. We have also investigated the properties of the ternary algebra associated with the 3-dimensional arrays. Further, the multi-dimensional approach has been used by us to the representation of uncertain information in conjunction with the Dempster-Schafer theory. It has been shown how to compute the information regarding the probability of occurrences of the variables as certain matrix products. Digital signal processing, Transforms, Multi-dimensional arrays.

DESCRIPTORS: (U) \*ALGEBRA, \*SIGNAL PROCESSING, \*DISCRETE  
FOURIER TRANSFORMS, APPROACH, ARRAYS, MULTIPLICATION,  
PROBABILITY, SIGNALS, THEORY, VARIABLES, THREE  
DIMENSIONAL.

IDENTIFIERS: (U) Dempster Schafer Theory, \*Digital

AD-A284 167

AD-A284 166

UNCLASSIFIED

PAGE #2 T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A284 166 CONTINUED  
systems

AD-A284 165 20/8 21/4 6/11

ARIZONA UNIV TUCSON

(U) Research Training of the Effects of Toxic Substances  
on the Lungs. (FY91 AASERT).

DESCRIPTIVE NOTE: Annual rept. 1 Jun 93-31 May 94,

MAY 94 8P

PERSONAL AUTHORS: Witten, Mark L.

CONTRACT NO. F49620-92-J-0325

PROJECT NO. 3484

TASK NO. S4

MONITOR: AFOSR, XC  
TR-94-0491, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) Allison and Brian will continue to work on the chronic jet fuel exposure research project. However, Allison will also participate in our magnetic resonance imaging (MRI) project. We are attempting to develop a portable MRI system for deployment on either the Space Shuttle or Space Station. In addition, we are studying the possibility of using MRI in our toxicology experiments to determine changes in blood flow and organ perfusion after exposure to environmental toxins. Both Allison and Brian are intelligent students and I expect them to maintain their high level of performance in their coursework.

DESCRIPTORS: (U) \*JET ENGINE FUELS, \*MAGNETIC RESONANCE, \*TOXICOLOGY, ADDITION, BLOOD, DEPLOYMENT, FLOW, PERFUSION, SPACE SHUTTLES, SPACE STATIONS, STATIONS, STUDENTS, WORK, TOXIC AGENTS, ENVIRONMENTAL TESTS, WOUNDS AND INJURIES, EXPOSURE (PHYSIOLOGY).

IDENTIFIERS: (U) PE61103D, WUAFOSR3484S4.

AD-A284 166

AD-A284 165

UNCLASSIFIED

PAGE 43

T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A284 164 CONTINUED

CORNELL UNIV ITHACA NY DIV OF BIOLOGICAL SCIENCES

(U) Research Training For Understanding the Fate of Environmental Pollutants. (FY91 AASERT).

DESCRIPTIVE NOTE: Annual rept. 1 Jun 93-31 May 94,

MAY 94 28P

PERSONAL AUTHORS: Madsen, Eugene

CONTRACT NO. F49620-93-1-0414

PROJECT NO. 3484

TASK NO. YS

MONITOR: AFOSR, XC  
TR-94-0492, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) This proposal requests funds to further involve, graduate students, in environmental research sponsored by the United States Air Force Office of Scientific Research (AFOSR). The participants will learn to utilize a combination of laboratory and field approaches to identifying physical, chemical, genetic, and physiological influences that govern the accumulation and biodegradation of polycyclic aromatic hydrocarbons (PAHs). These and related compounds are among the chemicals whose environmental fate is of concern to the U. S. Air Force and other Department of Defense agencies. The Principal Investigator and colleagues have conducted a prior, independent study that has shown that, despite the presence of PAH metabolizing microorganisms, PAHs persist at a site where freshwater sediments are fed by PAH-contaminated groundwater. Hypotheses to be tested address fundamental mechanisms for the persistence of environmental pollutants, these include: the rate of delivery meets or exceeds the rate of biodegradation; the PAHs are not available to microbial populations due to rapid, short term sorption onto the sediment organic matter, or due to long term (aging) sorption into a spatially remote compartment of the microporous structure of sediment organic matter, or due to complexation reactions with dissolved organic carbon, or due to the physical arrangement of the sediment matrix which

AD-A284 164

AD-A284 164

UNCLASSIFIED

PAGE

48

T4035K

prevents contact between PAHs and microorganisms.  
DESCRIPTORS: (U) \*WATER POLLUTION, \*NAPHTHALENES, \*PHENANTHRENES, ACCUMULATION, CHEMICAL CONTAMINATION, BIODETERIORATION, POLYCYCLIC COMPOUNDS, ENVIRONMENTAL MANAGEMENT, DEPARTMENT OF DEFENSE, GENETICS, HYPOTHESES, MICROORGANISMS, SEDIMENTS, SORPTION, STUDENTS, UNITED STATES AIR FORCE ACADEMY, TOXIC HAZARDS, AIR FORCE RESEARCH.

IDENTIFIERS: (U) PE61103D, WJAFOSR3484YS,  
\*PAH(Polycyclic Aromatic Hydrocarbons)



UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A284 163 CONTINUED

AD-A284 163 7/6 20/5

MASSACHUSETTS UNIV AMHERST DEPT OF POLYMER SCIENCE AND  
ENGINEERING

(U) Multi-Functional pi-Conjugated Macromolecules Based on  
Poly(Phenylene Vinylene).

DESCRIPTIVE NOTE: Annual rept. 15 Mar 93-14 Mar 94,

MAR 94 22P

PERSONAL AUTHORS: Karasz, Frank E.

CONTRACT NO. F49620-93-1-0178

PROJECT NO. 2303

TASK NO. CS

MONITOR: AFOSR, XC  
TR-94-0507, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) This report is for the period 15 Mar 93 to 14 Mar 94 and covers all AFOSR supported research under the P.I.'s direction. The principal thrusts of the research are in four relatively disparate areas related only by a polymeric theme: conjugated macromolecules; thermodynamics of inorganic-organic block copolymers; hyperbranched (dendritic) macromolecules; theoretical dielectric strength of polymers. However, because the present grant was the successor to a series of more widely focused AFOSR funding periods the opportunity was taken to complete numerous projects which originated earlier. As a result some forty-six AFOSR-supported manuscripts were published or were in press during the grant period. The focus of attention with respect to conjugated macromolecules was their electroluminescent (EL) properties. The fact that poly-p-phenylene vinylene (PPV) displayed EL has been known since 1992, and in the present work, based on many years of AFOSR-supported PPV research, derivatives of PPV were synthesized and characterized in terms of their electro-optical properties. In particular a series of conjugated-nonconjugated multi-block copolymer with extremely promising EL properties were studied and EL devices constructed. In these materials the hard blocks were short, monodisperse, phenylene vinylene oligomers, or

derivatives thereof, while the soft block were oligomethylene spacer units designed to impart solubility and film formation to the materials. By varying the nature of the hard block EL emission throughout the visible spectral range was achieved

DESCRIPTORS: (U) \*BLOCK COPOLYMERS, \*MACROMOLECULES, DIELECTRIC STRENGTH, EMISSION, FILMS, OLIGOMERS, OPTICAL PROPERTIES, SOLUBILITY, THERMODYNAMICS, NUCLEAR MAGNETIC RESONANCE, ELECTROLUMINESCENCE, POLYMERIZATION, SYNTHESIS(CHEMISTRY), MOLECULAR WEIGHT, ULTRAVIOLET SPECTROSCOPY.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303CS, \*PPV(Poly Phenylene Vinylene)

AD-A284 163

AD-A284 163

UNCLASSIFIED

PAGE 45

T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A284 162 17/5.1

TEXAS UNIV AT AUSTIN

AD-A284 162 CONTINUED

a MasPar parallel computer.

(U) Local Spatio-Temporal Analysis in Vision Systems.

DESCRIPTIVE NOTE: Annual rept. no. 1, 1 May 93-31 May 94,

JUL 94 31P

PERSONAL AUTHORS: Geisler, Wilson S.; Bovik, Alan;  
Cormack, Lawrence; Ghosh, Joydeep; Gildeen, David

CONTRACT NO. F49620-93-1-0307

PROJECT NO. 3484

TASK NO. HS

MONITOR: AFOSR, XC  
TR-94-0504, AFOSR

DESCRIPTORS: (U) \*COMPUTER VISION, \*IMAGE PROCESSING,  
\*CORRELATION, \*INFRARED IMAGES, \*OPTICAL IMAGES,  
ALGORITHMS, CODING, COMPUTERS, CONSTRUCTION, DEPTH,  
FREQUENCY, PERFORMANCE(HUMAN), INSTALLATION, LOW LEVEL,  
MODELS, MONKEYS, NUMBERS, PRIMATES, PROCESSING, SHAPE,  
STRUCTURES, TEXAS, TEXTURE.

IDENTIFIERS: (U) PE61103D, WUAFOSR3484HS.

#### UNCLASSIFIED REPORT

ABSTRACT: (U) The aims of this project are to (1) develop a physiologically and psychophysically based model of low-level human visual processing (a key component of which are local frequency coding mechanisms), (2) develop image models and image-processing methods based upon local frequency coding, (3) develop algorithms for performing certain complex visual tasks based upon local frequency representations, (4) develop models of human performance in certain complex tasks based upon our understanding of low-level processing, (5) develop a computational testbed for implementing, evaluating and visualizing the proposed models and algorithms, using a massively parallel computer. Progress has been substantial on all aims. The highlights include, (1) completion of a number of psychophysical and physiological experiments revealing new, systematic and exciting properties of the primate (human and monkey) visual system, (2) further development of image models that can accurately represent the local frequency structure in complex images, (3) near completion in the construction of the Texas Active Vision Testbed, (4) development and testing of several new computer vision algorithms dealing with shape-from-texture, shape-from-stereo, and depth-from-focus, (5) implementation and evaluation of several new models of human visual performance, (6) evaluation, purchase and installation of

AD-A284 162

AD-A284 162

UNCLASSIFIED

PAGE 46 T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A284 147 CONTINUED

\*SEC(Spectroelectrochemistry)

AD-A284 147 7/4 20/5

TENNESSEE UNIV KNOXVILLE DEPT OF CHEMISTRY

(U) Spectroelectrochemical Investigations of Molten Halide Solutions.

DESCRIPTIVE NOTE: Annual technical rept. no. 2, 1 May-30 Apr 93,

JUN 94 5P

PERSONAL AUTHORS: Mamantov, Gleb

CONTRACT NO. F49620-92-J-0222

PROJECT NO. 3484

TASK NO. S2

MONITOR: AFOSR, XC  
TR-94-0500, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The main objective of this research, performed by Ellen Kurt Hondrogannis, a graduate student at the University of Tennessee, is to investigate the utility of the combination of spectroscopy and electrochemistry, or spectroelectrochemistry (SEC), for studies of redox processes in molten halides. The initial studies involved the use of UV-visible, Raman, and electron spin resonance SEC to identify the radical anion intermediate formed during the electrochemical reduction of tetrachloro-p-benzoquinone, or chloranil, in the basic (50 mole percent AlCl<sub>3</sub>) molten sodium chloroaluminate melt at 175 Degree C. This anion intermediate had not been detected in this melt previously, since cyclic voltammetry shows only one wave which had previously been attributed to a single two electron reduction to the dianion

DESCRIPTORS: (U) \*ELECTROCHEMISTRY, \*HALIDES, \*OXIDATION REDUCTION REACTIONS, ANIONS, ELECTRON SPIN RESONANCE, QUINONES, SODIUM COMPOUNDS, SOLUTIONS(MIXTURES), DECOMPOSITION, RAMAN SPECTROSCOPY, ULTRAVIOLET SPECTROSCOPY, MOLTEN SALTS, VOLTAMMETRY, REACTION KINETICS.

IDENTIFIERS: (U) PE61103D, WUAFOSR3484S2,

AD-A284 147

AD-A284 147

UNCLASSIFIED

PAGE 47

T4035K

## UNCLASSIFIED

## DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. T4035K

AD-A284 145 7/4 20/10 20/8 20/5

AD-A284 143 7/4 20/8 7/6

FLORIDA UNIV GAINESVILLE QUANTUM THEORY PROJECT

CALIFORNIA UNIV LOS ANGELES DEPT OF CHEMISTRY AND BIOCHEMISTRY

(U) Relativistic Effects at the Correlated Level. An Application to Interhalogens,

(U) First-Principles-Derived Rate Constants for H Adatom Surface Diffusion on Si(100)-2x1,

DEC 93 11P

MAY 94 14P

PERSONAL AUTHORS: Perera, S. A.; Bartlett, Rodney J.

PERSONAL AUTHORS: Wu, Christine J.; Ionova, Irina V.; Carter, Emily A.

CONTRACT NO. F49620-93-1-0127

PROJECT NO. 2301

CONTRACT NO. F49620-93-1-0145

TASK NO. DS

MONITOR: AFOSR, XC

MONITOR: AFOSR, XC  
TR-94-0530, AFOSR

TR-94-0525, AFOSR

UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

Availability: Pub. in Chemical Physics Letters, v216 n3,4, 5,6, p606-612, 31 Dec 93. Available to DTIC users only. No copies furnished by NTIS.

Availability: Pub. in Physical Review B, v49 n19 p13488-13500, 15 May 94. Available to DTIC users only. No copies furnished by NTIS.

ABSTRACT: (U) Relativistic effects are significantly important in understanding the electronic structure and spectra of heavy atoms or molecules containing such atoms. Estimation of relativistic effects at the coupled-cluster (CC) level, using the Cowan-Griffin quasi-relativistic many-electron Hamiltonian, is described. The relativistic effects are treated as an external perturbation to the non-relativistic Born-Oppenheimer many-electron Hamiltonian and are evaluated analytically by the 'relaxed' density formulation of coupled-cluster (CC) theory. Applicability of the method is demonstrated by calculating relativistic corrections to the ground state energies and dipole moments of diatomic interhalogens. We also present comparisons with relativistic effective potential results

DESCRIPTORS: (U) \*RELATIVISTIC ELECTRONS, \*HALOGENS, ATOMS, DENSITY, ELECTRONICS, ELECTRONS, MOLECULES, PERTURBATIONS, SPECTRA, STRUCTURES, REPRINTS, MOLECULAR STRUCTURE, GROUND STATE, DIPOLE MOMENTS, ENERGY, DIATOMIC MOLECULES.

IDENTIFIERS: (U) Chemical physics, \*Interhalogens, CC(Coupled Cluster)

AD-A284 145

AD-A284 143

UNCLASSIFIED

PAGE 48 . T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. T4035K

AD-A284 143 CONTINUED

AD-A284 132 6/5

TEXAS A AND M UNIV COLLEGE STATION DEPT OF BIOLOGY

DESCRIPTORS: (U) \*ATOMS, \*DIFFUSION, \*HYDROGEN, \*SILICON, \*SURFACES, \*ANISOTROPY, ACTIVATION, ACTIVATION ENERGY, ADATOMS, ADSORPTION, CONSTANTS, DESORPTION, DIMERS, EDGES, ELECTRONICS, INTERACTIONS, MODELS, RATES, SIMULATION, SITES, STRUCTURES, TEMPERATURE, THEORY, TRANSITIONS, VALUE, POTENTIAL ENERGY, CHEMICAL REACTIONS, REPRINTS.

(U) Graduate Student Training in Chronobiology. (FY91 Assert). The Suprachiasmatic Nucleus Controls the Circadian Rhythm of Heart Rate Via the Sympathetic Nervous System.

DESCRIPTIVE NOTE: Annual rept. 1 Jun 93-31 May 94,

IDENTIFIERS: (U) PE61102F

94 11P

PERSONAL AUTHORS: Cassone, Vincent M.; Warren, Wade S.; Champney, Thomas H.

CONTRACT NO. F49620-92-J-0238

PROJECT NO. 3484

TASK NO. S4

MONITOR: AFOSR, XC  
TR-94-0515, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The mammalian suprachiasmatic nucleus (SCN) controls a wide variety of circadian behavioral and physiological processes. The specific motor output pathway(s) by which these diverse processes are controlled are unknown. The only established motor output of this system is the regulation of pineal melatonin synthesis via the sympathetic nervous system. It is therefore possible that other peripheral circadian rhythms are regulated similarly. To address this issue, body temperature (BT), general activity (GA), wheel-running activity (WR), and heart rate (HR) were recorded in laboratory rats, and the effects of SCN lesion (SCNX) abolished circadian patterns in all motor outputs, whereas sham animals showed robust rhythms in all measures. In contrast, guanethidine, which depleted peripheral but not central catecholamine content, selectively reduced HR circadian rhythmicity. Other rhythms (BT, GA, and WR) were unaffected. These results suggest that the SCN influences some peripheral targets via circadian regulation of the sympathetic nervous system, and other circadian outputs are regulated via different, unknown pathways

AD-A284 143

AD-A284 132

UNCLASSIFIED

PAGE 49

T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A284 132 CONTINUED

AD-A284 131 20/6

DESCRIPTORS: (U) \*CIRCADIAN RHYTHMS, \*HEART RATE,  
\*SYMPATHETIC NERVOUS SYSTEM, ANIMALS, BODY TEMPERATURE,  
CATECHOLAMINES, CONTRAST, CONTROL, LABORATORIES, LESIONS,  
MELATONIN, MOTORS, OUTPUT, PATTERNS, RATES, RATS,  
REGULATIONS, SYNTHESIS, TARGETS, WHEELS, REPRINTS.

MISSOURI UNIV-COLUMBIA DEPT OF PHYSICS AND ASTRONOMY  
(U) Wavelets and Scattering.

DESCRIPTIVE NOTE: Final rept. 1 Jun 90-31 May 94,

IDENTIFIERS: (U) PEG1103D, WUAFOSR3484S4,  
Suprachiasmatic nucleus

JUL 94 17P

PERSONAL AUTHORS: Welland, Grant V.; DeFacio, Brian

CONTRACT NO. AFOSR-90-0307

MONITOR: AFOSR, XC  
TR-94-0476, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) During this project wavelets were used to analyze several problems in signal processing, quantum optics, elastic wave nondestructive evaluation, electromagnetic scattering and the dielectric response of water. A number of research papers were published including the first calculation of p-wavelets. Another publication shows the scale change of wavelet theory corresponds to the squeezing operation in quantum optics. A wavelet approach to visual recognition of faces was completed and has been submitted for publication. The Calderon-Grossmann-Morlet reproducing formula was shown to hold for the two-sided ideal of Hilbert-Schmidt operators. In elastic wave NDE, the frequency scales in phase space for the front face echo were shown to require a very different compression from the other scales. New results on Maxwell's equations in regions with Lipschitz boundaries were published. Wavelets. Signal processing, Optics, Nondestructive evaluation, Electromagnetism, Inverse problems and applied mathematics

DESCRIPTORS: (U) \*ELECTROMAGNETIC WAVE PROPAGATION,  
\*DIELECTRIC PROPERTIES, APPLIED MATHEMATICS, COMPRESSION,  
DIELECTRICS, ECHOES, ELASTIC WAVES, ELECTROMAGNETIC  
SCATTERING, ELECTROMAGNETISM, FREQUENCY, MATHEMATICS,  
OPTICS, NONDESTRUCTIVE TESTING, OPTICAL PROCESSING,  
PATTERN RECOGNITION, SCATTERING, SIGNAL PROCESSING, WATER.

IDENTIFIERS: (U) Wavelet transforms

IAC NO. NT-51188

AD-A284 132

AD-A284 131

UNCLASSIFIED

PAGE 50 T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A284 131 CONTINUED

AD-A284 130 7/4 20/10 20/8 7/2

IAC DOCUMENT TYPE: NTIAC - MICROFICHE --

FLORIDA UNIV GAINESVILLE QUANTUM THEORY PROJECT

IAC SUBJECT TERMS: N--(U) ELECTROMAGNETIC WAVES, WAVE PROPAGATION, DIELECTRIC PROPERTIES, COMPRESSION, DIELECTRICS, ELASTIC WAVES, ELECTROMAGNETIC SCATTERING, ELECTROMAGNETISM, OPTICS, OPTICAL PROCESSING, PATTERN RECOGNITION, SCATTERING, SIGNAL PROCESSING, WATER.;

(U) Coupled-Cluster Calculations of Indirect Nuclear Coupling Constants: The Importance of Non-Fermi Contact Contributions,

AUG 94 7P

PERSONAL AUTHORS: Perera, S. A.; Sekino, Hideo; Bartlett, Rodney J.

CONTRACT NO. F49620-93-1-0127

PROJECT NO. 2301

TASK NO. DS

MONITOR: AFOSR, XC  
TR-94-0532, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Jnl. of Chemistry Physics, v101 n3 p2186-2191, 1 Aug 94. Available to DTIC users only. No copies furnished by NTIS.

ABSTRACT: (U) Electron correlation effects to the four coupling mechanisms which contribute to the isotropic nuclear spin-spin coupling constant, the Fermi contact (FC), paramagnetic spin-orbit (PSO), spin-dipole (SD), and diamagnetic spin-orbit (DSO) are studied using the equation of motion coupled-cluster (EOM-CC) method. The second-order properties are expressed as a sum-over state (SOS) using EOM-CC intermediate state wave functions. This formulation is simple, accurate, computationally convenient, and involves no truncation. Several molecules, HF, CO, N<sub>2</sub>, H<sub>2</sub>O, NH<sub>3</sub>, and HCl which have been previously shown to have large noncontact contributions are investigated using the EOM-CC method and the results are compared with experiment and other theoretical methods, including polarization propagator and finite-field MBPT(2) methods. Using fairly large basis sets, the EOM-CCSD provides results which agree with experimental indirect nuclear spin-spin coupling constants to within an average error of 13%

DESCRIPTORS: (U) \*CONSTANTS, \*COUPLINGS, \*NUCLEAR SPINS, CORRELATION, DIPOLES, ELECTRONS, EQUATIONS, ERRORS,

AD-A284 131

AD-A284 130

UNCLASSIFIED

PAGE 51

T4035K



UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A284 130 CONTINUED

AD-A284 126 21/2

FORMULATIONS, FUNCTIONS, MOLECULES, MOTION, ORBITS, POLARIZATION, TRUNCATION, WAVE FUNCTIONS, REPRINTS, COMPUTATIONS, SPIN STATES, MOLECULAR ORBITALS, MAGNETIC PROPERTIES, HYDROGEN FLUORIDE, CARBON MONOXIDE, NITROGEN, WATER, AMMONIA, QUANTUM THEORY.

PRINCETON UNIV NJ DEPT OF MECHANICAL AND AEROSPACE ENGINEERING

(U) Studies on high Pressure and Unsteady Flame Phenomena.

DESCRIPTIVE NOTE: Annual rept. 15 Apr 93-14 Apr 94,

IDENTIFIERS: (U) WUAFOSR2301DS, CC(Coupled Cluster), \*Coupled cluster, Indirect, Non-Fermi contact, EOM(Equation of Motion), PSO(Paramagnetic Spin Orbit), Basic sets

JUN 94 55P

PERSONAL AUTHORS: Law, C. K.

CONTRACT NO. F49620-92-J-0227

PROJECT NO. 2308

TASK NO. BS

MONITOR: AFOSR, XC  
TR-94-0501, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The objective of the present program is to study the structure and response of steady and unsteady laminar premixed and nonpremixed flames in reduced and elevated pressure environments through (a) non-intrusive experimentation, (b) computational simulation using detailed flame and kinetic codes, and (c) asymptotic analysis with reduced kinetic mechanisms. During the reporting period progress has been made in the following projects: (1) a theoretical and experimental study of unsteady diffusion flames; (2) a computational and experimental study of hydrogen/air diffusion flames at sub- and super-atmospheric pressures; (3) an asymptotic analysis of the structure of premixed flames with volumetric heat loss; (4) asymptotic analyses of ignition in the supersonic hydrogen/air mixing layer with reduced mechanisms; (5) a new numerical algorithm for generating the ignition-extinction S-curves. A total of three reprints are appended. Flames, Extinction, High pressure combustion, Unsteady combustion, H2-O2 Combustion, Supersonic combustion.

DESCRIPTORS: (U) \*FLAMES, AIR, ALGORITHMS, BAROMETRIC PRESSURE, DIFFUSION, EXTINCTION, HEAT LOSS, HIGH PRESSURE, HYDROGEN, IGNITION, KINETICS, MIXING, SUPERSONIC COMBUSTION, BURNING RATE, OXYGEN, HYDROGEN, METHANE, AIR FLOW, LAMINAR FLOW, ACTIVATION ENERGY, FLOW FIELDS,

AD-A284 130

AD-A284 126

UNCLASSIFIED

PAGE 52 T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A284 126 CONTINUED

AD-A284 122 9/3

VOLUMETRIC ANALYSIS, COMPUTERIZED SIMULATION, ALGORITHMS.

JACKSON STATE UNIV MS DEPT OF MATHEMATICS

IDENTIFIERS: (U) PE61102F

(U) Mathematical Analysis of Three Free-Electron-Laser Issues.

DESCRIPTIVE NOTE: Final rept. 1 Dec 90-30 Nov 93,

NOV 93 11P

PERSONAL AUTHORS: Johnston, Shayne

CONTRACT NO. F49620-91-C-0013

PROJECT NO. 2304

TASK NO. BS

MONITOR: AFOSR, XC  
TR-94-0544, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The central idea underlying this project was that sideband instabilities could be controlled by optical guiding effects through the radiation of slippage between electron bunches and the radiation field. However, none of the related six research objectives in the original proposal to AFOSR has been truly complete. The principal advances made during the period of AFOSR support include: the recognition that enhanced radiation pressure can produce disruptive velocity changes in the presence of slippage (ITR1), the viability of an electron macroparticle model of sideband instabilities (ITR2), and an analysis (including radiative reaction) of the analogous problem of resonance scattering (ITR2). The recognition that electrostatic waves could correlate repelling particles on a length scale much shorter than a wavelength (ITR2) led the PI to an important application to anomalous transport in turbulent plasma.

DESCRIPTORS: (U) \*FREE ELECTRON LASERS, ELECTROSTATICS, INTERACTIONS, PARTICLES, RADIATION PRESSURE, RESONANCE SCATTERING, SIDEBANDS, ELECTRON TRANSPORT, TURBULENCE, VELOCITY, VIABILITY, OPTICAL WAVEGUIDES.

IDENTIFIERS: (U) WUAFOSR2304BS, PE61102F

AD-A284 126

AD-A284 122

UNCLASSIFIED

PAGE 53

T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A284 113

7/4

12/1

20/5

7/2

AD-A284 113

CONTINUED

OKLAHOMA STATE UNIV STILLWATER DEPT OF CHEMISTRY

IDENTIFIERS: (U) PE61102F, WUAF0SR2303FS, \*Fourier transform, Four atoms, Intramolecular, Collinear, Mode to mode

(U) Classical Intramolecular Energy-Transfer Rates Using Fourier Transform Methods: Four-Atom Systems,

94

8P

PERSONAL AUTHORS: Chang, Xiao Y.; Bintz, Karen L.; Thompson, Donald L.; Raff, Lionel M.

REPORT NO. 1-5-19592

PROJECT NO. 2303

TASK NO. FS

MONITOR: AFOSR, XC  
TR-94-0528, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Jnl. of Physical Chemistry, v98 n25 p6317-6323, 1994. Available to DTIC users only. No copies furnished by NTIS.

ABSTRACT: (U) A previously reported Fourier transform method for computation of classical intramolecular mode-to-mode energy-transfer rate coefficients is extended to four-atom molecules. HONO and C2H2 are used as test cases. The method involves the Fourier transform of the time variation of a local-mode bond energy for an ensemble of trajectories. A two-mode, collinear model is employed to demonstrate that the transform is expected to contain a series of spectral bands at frequencies corresponding to the mode-to-mode energy-transfer rates. Heavy-atom blocking and constrained motion methods are employed to determine the individual band assignments. The results for both HONO and C2H2 are in good accord with the total relaxation rate extracted from decay plots of the local-mode energy. Intramolecular energy transfer

DESCRIPTORS: (U) \*ENERGY TRANSFER, ALLOCATIONS, ATOMS, BLOCKING, COEFFICIENTS, COMPUTATIONS, DECAY, FREQUENCY, MODELS, MOLECULES, MOTION, RATES, RELAXATION, TEST AND EVALUATION, TIME, TRAJECTORIES, VARIATIONS, REPRINTS, MOLECULAR PROPERTIES, HYDROGEN, OXYGEN, ACETYLENE, BENDING, CHEMICAL BONDS, VIBRATION, PHYSICAL CHEMISTRY.

AD-A284 113

AD-A284 113

UNCLASSIFIED

PAGE

94

T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A284 111 6/5 AD-A284 111 CONTINUED

COLORADO STATE UNIV FORT COLLINS DEPT OF ANATOMY AND NEUROBIOLOGY

DESCRIPTORS: (U) \*NERVE CELLS, \*SYNAPSE, ACIDS, ADDITION, AMINO ACIDS, CELLS, CHEMICALS, CLAMPS, MEMBRANES, PREPARATION, RUPTURE, WORK, NERVOUS SYSTEM, ELECTROPHYSIOLOGY.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2312CS, Suprachiasmatic nucleus

(U) Cellular Neurophysiology of the Rat Suprachiasmatic Nucleus: Electrical Properties, Neurotransmission, and Mechanisms of Synchronization.

DESCRIPTIVE NOTE: Annual rept. 1 Jul 93-30 Jun 94,

JUL 94 108P

PERSONAL AUTHORS: Dudek, F. E.

CONTRACT NO. F49620-93-1-0302

PROJECT NO. 2312

TASK NO. CS

MONITOR: AFOSR, XC  
TR-94-0513, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The general aim of this research has been to understand the electrophysiological properties and synaptic mechanisms of suprachiasmatic nucleus (SCN) neurons. Our earlier experiments included sharp-intracellular-electrode analyses of amino-acid-mediated synaptic transmission and intrinsic membrane properties, focussing on the degree to which SCN neurons are homogenous or heterogeneous. This work showed that GABA (in addition to glutamate) plays a critical role in fast synaptic transmission in the SCN, and that SCN neurons are not homogenous in terms of their electrophysiological properties, although they could not be grouped into distinct neuron classes. More recently, multiple-unit extracellular recordings have shown synchronous bursts of action potentials in the SCN in low (Ca(2+)) solutions containing amino-acid-receptor antagonists demonstrated to block chemical synapses, thus suggesting that SCN neurons can communicate through nonsynaptic mechanisms. Our more recent studies using whole-cell patch-clamp techniques in the thin-slice preparation have shown evidence for local GABA-ergic communication among SCN neurons, and have begun to define the different types of K(+) currents present in SCN neurons

AD-A284 111

AD-A284 111

UNCLASSIFIED

PAGE 55

T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. T4D35K

AD-A284 108

20/5

7/2

12/9

12/1

AD-A284 107

20/6

GEORGIA UNIV RESEARCH FOUNDATION INC ATHENS

COGNITECH INC SANTA MONICA CA

(U) Photogeneration and Characterization of Energetic Molecules in Supersonic Molecular Beams.

(U) Reconstruction of Shapes from Shading and Shape Based Image Reconstruction Using Modern Nonlinear Analysis.

DESCRIPTIVE NOTE: Final rept.,

DESCRIPTIVE NOTE: Final rept. 15 Sep 91-29 Apr 94,

JUN 94 16P

JUN 94 19P

PERSONAL AUTHORS: Duncan, Michael A.

PERSONAL AUTHORS: Osher, Stanley

CONTRACT NO. AFOSR-91-0001

REPORT NO. TR-31

PROJECT NO. 2303

CONTRACT NO. F49620-91-C-0083

TASK NO. A3

PROJECT NO. 7981

MONITOR: AFOSR, XC  
TR-94-0483, AFOSR

MONITOR: AFOSR, XC  
TR-94-0518, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) A variety of weakly bound and/or metastable molecules have been investigated in the environment of a pulsed supersonic molecular beam. Experiments were attempted with little success for the production of metastable oxygen ring systems. Other experiments focused on metal ion and metal neutral complexes with small molecules or rare gas atoms. Spectroscopic studies were successful for magnesium ion complexes with the rare gases and with carbon dioxide, water, and nitrogen. Aluminum atom van der Waals complexes were studied with high resolution photoelectron spectroscopy. These studies obtained a variety of new data on metal condensation energetics and the structure of the initial phases of condensation. Oxygen rings, Metal ion complexes, Metal van der Waals complexes

DESCRIPTORS: (U) \*METAL COMPLEXES, \*MOLECULAR COMPLEXES, ALUMINUM, ATOMS, CARBON DIOXIDE, CONDENSATION, HIGH RESOLUTION, IONS, MAGNESIUM, MOLECULAR BEAMS, MOLECULES, NITROGEN, OXYGEN, PHOTOELECTRONS, RARE GASES, WATER, EXCITATION, ION MOLECULE INTERACTIONS, METASTABLE STATE, VAN DER WAALS FORCES, MASS SPECTROSCOPY, MOLECULAR VIBRATION.

IDENTIFIERS: (U) PE61102F

AD-A284 108

AD-A284 107

UNCLASSIFIED

PAGE

56

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ABSTRACT: (U) Shape based restoration, frame fusion, stereo matching, reconstruction of shapes-from-shading, photometric stereo and video processing were successfully integrated into a partial differential equations based framework. Tools from the theory viscosity solutions, nonoscillatory approximations, and calculus of variations were used to develop state-of-the-art algorithms in these areas. Frame fusion, Stereo matching, Photometric stereo, Shape-from-shading, ENO, Denoising, Restoration

DESCRIPTORS: (U) \*ALGORITHMS, \*IMAGE RESTORATION, \*PARTIAL DIFFERENTIAL EQUATIONS, CALCULUS OF VARIATIONS, IMAGE PROCESSING, FRAMES, MATCHING, PHOTOMETRY, NONLINEAR ANALYSIS, SHAPE, STATE OF THE ART, BOUNDARY VALUE PROBLEMS, SOLUTIONS(GENERAL), ILLUMINATION, VISCOSITY, SHADOWS, LIGHT SCATTERING, THREE DIMENSIONAL, PATTERN RECOGNITION.

IDENTIFIERS: (U) PE61102F

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A284 103 6/4 17/11

AD-A284 103 CONTINUED

PITTSBURGH UNIV PA

INTERACTIONS, MOTION, ROTATION, STIMULI, TEST AND EVALUATION, TRACKING, VELOCITY, YIELD, VISUAL ACUITY.

(U) Visuo-Ocular Performance During Vestibular Stimulation.

IDENTIFIERS: (U) PE61102F, WUAFOSR2313CS, Vestibular stimulation, Ocular tracking

DESCRIPTIVE NOTE: Annual rept. 1 Jul 93-30 Jun 94,

JUN 94 6P

PERSONAL AUTHORS: Furman, Joseph M.; Carl, James A.

CONTRACT NO. F49620-93-1-0261

PROJECT NO. 2313

TASK NO. CS

MONITOR: AFOSR, XC  
TR-94-0510, AFOSR

UNCLASSIFIED REPORT

**ABSTRACT:** (U) The objective of this study is to enhance knowledge regarding spatial orientation and disorientation in environments characterized by combined stress, namely simultaneous visual and vestibular stimulation. This study will test the hypothesis that target acquisition, ocular tracking, and visual search are degraded by vestibular stimulation using off-vertical axis rotation. Target acquisition stimuli will consist of a spot moving suddenly to a new location in a pseudo-random fashion; ocular tracking stimuli will consist of constant velocity target motion. Visual search will combine these stimuli. Eye movements will be recorded using the magnetic scleral search coil method. Analysis of the data will yield measures of saccadic latency and accuracy, and ocular pursuit gain. Calculated performance measures will be compared across visual and vestibular stimulus conditions with analysis of variance. The goal of the first year of research was to develop protocols and assess visual-vestibular interaction. As proposed for the first year, 15 normal subjects (8F, 7M) have been tested with the entire protocol of vestibular, visual, and visual-vestibular stimuli. With these first year studies completed, studies for the second year have begun.

**DESCRIPTORS:** (U) \*TARGET ACQUISITION, \*VESTIBULAR APPARATUS, ACCURACY, ANALYSIS OF VARIANCE, COILS, CONSTANTS, ENVIRONMENTS, EYE MOVEMENTS, GAIN,

AD-A284 103

AD-A284 103

UNCLASSIFIED

PAGE 57

T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. T4035K

AD-A284 102 7/6 20/5

AD-A284 101 5/8 6/4

TEXAS UNIV AT AUSTIN DEPT OF CHEMISTRY

YALE UNIV NEW HAVEN CT DEPT OF PSYCHOLOGY

(U) Elemental Fluorine Based Syntheses of Pentafluoro Phenyl and other Aromatic Perfluoropolyether Polymers.

(U) A Parallel Processing Hypothesis for Short-Term and Long-Term Memory in Aplysia.

DESCRIPTIVE NOTE: Annual rept. 1 Feb 93-31 Jan 94,

DESCRIPTIVE NOTE: Annual rept. 1 May 93-30 Apr 94,

JAN 94 31P

APR 94 7P

PERSONAL AUTHORS: Lagow, Richard J.

PERSONAL AUTHORS: Carew, Thomas J.

CONTRACT NO. F49620-92-J-0104

CONTRACT NO. F49620-93-1-0273

PROJECT NO. 2303

PROJECT NO. 2312

TASK NO. DS

TASK NO. BS

MONITOR: AFOSR, XC  
TR-94-0511, AFOSR

MONITOR: AFOSR, XC  
TR-94-0499, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) Since we successfully obtained a fused perfluoro (benzofuran) from perfluoro (dicyclohexyl ether), reductive defluorination of the perfluorinated ethers containing three perfluoro (cyclohexyl) groups would be interesting. The three isomers of o-, m-, and p-perfluoro (dicyclohexanoxyl cyclohexane) were prepared by liquid-phase direct fluorination of o-, m-, and p-diphenoxyl benzene. After several runs of liquid-phase direct fluorination, enough amount of o-perfluoro (dicyclohexanoxyl cyclohexane) was collected to carry out the following reductive defluorination. The reductive defluorination was carried out from -70 to 70 degree for 2 days, but the ortho-ether, however, kept unreacted. One of the reasons for that is perhaps steric hindrance. Reductive defluorination of the meta- and para- ethers are under investigation

DESCRIPTORS: (U) \*POLYMERS, BENZENE, CYCLOHEXANES, ETHERS, FLUORINATION, ISOMERS, LIQUID PHASES, PHASE STUDIES, OXIDATION REDUCTION REACTIONS, SYNTHESIS(CHEMISTRY), FURANS, MOLECULAR STRUCTURE, MOLECULAR ISOMERISM.

IDENTIFIERS: (U) PES1102F, WUAFOSR2303DS, Perfluoropolyethers

AD-A284 102

AD-A284 101

UNCLASSIFIED

PAGE 58 . T4035K

ABSTRACT: (U) The primary focus of this program of research is a mechanistic analysis of the relationship between short-term and long-term information processing in central neural circuits of the marine mollusc Aplysia. During the last year we have completed several projects in this program; these projects fall into two broad classes which focus on facilitatory and, more recently, inhibitory information processing. We have identified several forms of behaviorally relevant cellular and circuit modifications which involve both facilitatory and inhibitory information processing. Our goal for the current year is to analyze each of these processes mechanistically, and determine their interaction in both short-term and long-term storage of information in identified neural networks.

DESCRIPTORS: (U) \*NEUROPHYSIOLOGY, \*MEMORY(PSYCHOLOGY), APLYSIA, CIRCUITS, INFORMATION PROCESSING, INTERACTIONS, MODIFICATION, NETWORKS, NEURAL NETS, PROCESSING, STORAGE, BRAIN, PERFORMANCE(HUMAN).

IDENTIFIERS: (U) PES1102F, WUAFOSR2312BS



## UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A284 100 CONTINUED

AD-A284 100 6/4

CALIFORNIA UNIV SAN DIEGO LA JOLLA DEPT OF PSYCHIATRY

SCIENCES.

(U) Extrathalamic Modulation of Cortical Responsiveness.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2312BS,  
NA(Noradrenergic), LC(Locus Coeruleus)

DESCRIPTIVE NOTE: Annual rept. 1 Jul 93-30 Jun 94,

AUG 94 23P

PERSONAL AUTHORS: Foote, Stephen L.

CONTRACT NO. F49620-93-1-0402

PROJECT NO. 2312

TASK NO. BS

MONITOR: AFOSR, XC  
TR-94-0514, AFOSR

## UNCLASSIFIED REPORT

**ABSTRACT:** (U) The overall goal of the proposed studies is to further elucidate the mechanisms by which the brainstem noradrenergic (NA) nucleus, locus coeruleus (LC), is capable of altering forebrain electrophysiological activity. The proposed studies have the following Specific Aims: (1) To examine the relationship between the intensity of LC neuronal activity, forebrain EEG activation, and rates of NA release in neocortex and hippocampus using microdialysis; (2) To test the hypothesis that LC-induced activation of forebrain EEG is mediated by LC/NA actions on septal and basal forebrain neurons; (3) To examine, in unanesthetized monkey, the effects of activating or inactivating the LC/NA system on forebrain EEG and on dialysis measures of NA and acetylcholine release in neocortex and hippocampus. The effects on these dialysis measures of systemic adrenergic drugs that alter cognitive performance will also be determined; (4) To examine, in monkey, the effects of activating or inactivating the LC/NA system on cortical and hippocampal EEG measures and on complex, bimanual motor behavior.

**DESCRIPTORS:** (U) \*NERVE CELLS, \*NUCLEI(BIOLOGY), ACETYLCHOLINE, ACTIVATION, BEHAVIOR, COGNITION, DIALYSIS, DRUGS, HIPPOCAMPUS, INTENSITY, LOCUS, MONKEYS, MOTORS, RATES, RELEASE, TEST AND EVALUATION, ELECTROENCEPHALOGRAPHY, ELECTROPHYSIOLOGY, BEHAVIORAL

AD-A284 100

AD-A284 100

UNCLASSIFIED

PAGE 59

T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A284 092 21/2

AD-A284 092 CONTINUED

PENNSYLVANIA STATE UNIV UNIVERSITY PARK DEPT OF  
MECHANICAL ENGINEERING

turbines, Diffusion flames, Particle growth

(U) Surface Reactivity of Combustion Generated Soot  
Particles.

DESCRIPTORS: (U) \*SOOT, BURNERS, FUELS, GAS TURBINES,  
INCANDESCENCE, MODIFICATION, REACTIVITIES, SAMPLING,  
SURFACES, TOLUENES, TURBULENT DIFFUSION, AIR FLOW, FLAME  
PROPAGATION, COMBUSTION DEPOSITS, PARTICLE SIZE,  
QUANTITATIVE ANALYSIS, TEMPERATURE GRADIENTS.

DESCRIPTIVE NOTE: Annual technical rept. 1 Jun 93-30 May  
94,

IDENTIFIERS: (U) PEG1103D, WUAFOSR3484S1, Laser induced  
incandescence, Laminar diffusion flames

JUL 94 78P

PERSONAL AUTHORS: Santoro, Robert J.

CONTRACT NO. F49620-92-J-0314

PROJECT NO. 3484

TASK NO. S1

MONITOR: AFOSR, XC  
TR-94-0516, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) During the second year of this AASERT program, efforts have remained focused on the further development of the laser-induced incandescence technique and the sampling of soot particles from diffusion flames. Characterization of the laser-induced incandescence technique for soot particle measurements in laminar diffusion flames has been completed. In particular, the relationship between laser fluence and the temporal character of the laser-induced incandescence signal has been carefully examined and documented. Based on this work, the technique is currently being extended to soot particle measurements in turbulent diffusion and droplet flames. Concurrently, efforts have continued on developing a sampling system to collect soot particles from laminar diffusion flames. Several modifications to the sampling system have been made to allow for the collection of sample sizes up to 0.1 gm of soot. A heated burner and vaporizer system have also been developed to allow for the study of liquid hydrocarbon fuels. Of particular interest for the present study is the effect of toluene on soot particle surface reactivity. Samples have recently been obtained in a series of laminar diffusion flames and analysis of the samples is currently underway. Soot particles, Surface reactivity, Gas

AD-A284 092

AD-A284 092

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T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A284 028 5/1

AD-A284 023 5/8

ENGINEERING FOUNDATION NEW YORK

HAHNEMANN UNIV. PHILADELPHIA PA

(U) Air Force Engineering Research Initiation Grant Program.

(U) Cerebellar Circuit Mechanisms Which Accompany Coordinated Limb Trajectory Patterns in the Rat: Use of a Model of Spontaneous Changes in Limb Coordination.

DESCRIPTIVE NOTE: Final rept. 1991-1993,

DESCRIPTIVE NOTE: Annual rept. Feb 93-Mar 94,

JUN 94 117P

AUG 94 7P

PERSONAL AUTHORS: Freiman, Charles V.

PERSONAL AUTHORS: Smith, Sheryl S.

CONTRACT NO. AFOSR-91-0212

CONTRACT NO. F49620-93-1-0136

MONITOR: AFOSR, XC  
TR-94-0539, AFOSR

UNCLASSIFIED REPORT

TASK NO. BS

ABSTRACT: (U) Grant AFOSR-91-0212 covers the Air Force Engineering Research Initiation Grant (AFERIG) program for the academic years 1991-1992 and 1992-1993. Twenty grants were made for 1991-1992 and eight for 1992-1993. The grant was for individual faculty within three years of hire or her first appointment. This report contains abstracts/summaries of the 28 grants. Publications supported by these grants are also listed at the end of the report. Air Force Engineering Research, Grant, Young faculty

MONITOR: AFOSR, XC  
TR-94-0542, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The olivo-cerebellar circuit plays a role in the coordination of the distal limbs. The present study was proposed to determine the behavior of individual neurons in this circuit, recorded chronically as ensembles of 10-20 during tests of limb coordination across spontaneous changes in limb coordination. Hormone (estrous) and circadian cycles are known to be associated with improvements in the speed and accuracy of limb trajectory, and will be used in this study as a model of changes in performance. Underlying circuit properties which accompany changes in performance will be assessed during performance paradigms. Rats, chronically implanted with microwires in the dorsal accessory olive and arrays of Purkinje cells in the paravermal cerebellum will be monitored during treadmill paradigms employing constant speed, variable acceleration and perturbed gait. Single unit discharge will then be analyzed and correlated with changes in performance associated with hormone state. The following parameters will be assessed: (1) step-cycle correlated discharge, (2) the strength of olivo-cerebellar connections, using cross-correlation techniques, (3) the degree of synchronized olivary oscillatory discharge, a putative timing mechanism for rapid movements and (4) changes in center-surround properties of adjacent arrays of Purkinje cells. Network,

DESCRIPTORS: (U) \*GRANTS, \*MILITARY ENGINEERING, \*AIR FORCE RESEARCH, ABSTRACTS, AIR FORCE, ENGINEERING, DOCUMENTS.

AD-A284 028

AD-A284 023

UNCLASSIFIED

PAGE 61

T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. T4035K

AD-A284 023 CONTINUED

AD-A283 960 20/2 7/4 7/2 11/4

Purkinje cell, Dorsal accessory olive, Oscillations, Center-surround, Limb coordination, Hormone/circadian cycle

CALIFORNIA UNIV SANTA BARBARA COLL OF ENGINEERING

(U) High Temperature Stability of Binary Microstructures Derived from Liquid Precursors.

DESCRIPTORS: (U) \*CEREBELLUM, \*NERVE CELLS, \*MEMORY DEVICES, \*LEARNING, ACCELERATION, ACCURACY, ARRAYS, CELLS, CIRCUITS, CONSTANTS, CORRELATION TECHNIQUES, CROSS CORRELATION, CYCLES, EXTREMITIES, HORMONES, MODELS, NETWORKS, OSCILLATION, PARAMETERS, RATS, TEST AND EVALUATION, TRAJECTORIES, TREADMILLS, VARIABLES, VELOCITY, BRAIN, NEUROCHEMISTRY, NERVE TRANSMISSION.

DESCRIPTIVE NOTE: Final rept. 15 Dec 90-30 Jun 94,

JUN 94 99P

PERSONAL AUTHORS: Lange, Fred F.

CONTRACT NO. AFOSR-91-0125

PROJECT NO. 2306

TASK NO. BS

MONITOR: AFOSR, XC  
TR-94-0522, AFOSR

UNCLASSIFIED REPORT

IDENTIFIERS: (U) WUAFOSR2312BS, PE61102F

ABSTRACT: (U) This program has emphasized two topics: (1) the crystallization of metastable, solid-solution structures, their partitioning into equilibrium metastable phase and its partitioning on forming unique, nanometer microstructures important to the mechanics of structural ceramics and their composites, and (2) the formation of single crystal thin films via spin coating single crystal substrates with solution precursors. Results for the first topic are now, namely, the discovery that diffusion limited crystallization concepts used in rapid solidification directly applies to precursors that crystallize at low temperatures during heating. This discovery is significant because solid-solutions can be greatly extended relative to high temperature synthesis and processing routes where equilibrium conditions are rapidly achieved and solid-solutions can be severely limited. Extension of solid-solution fields (and thus defect chemistries) in compositional space is important to synthesize now materials with optical and electronic properties controlled by defect chemistry and/or metastable compositions. Results for the second topic have shown that single crystal thin films can be formed on single crystal substrates with spin-on liquid precursors despite large differences in lattice parameters and/or crystal

AD-A284 023

AD-A283 960

UNCLASSIFIED

PAGE

62

T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. T4035K

AD-A283 960 CONTINUED

structures. Several mechanisms have been identified for the growth of single crystal thin films which are very different to the well known vapor phase epitaxy mechanisms. High temperature, Binary microstructures, Liquid precursors

DESCRIPTORS: (U) \*HIGH TEMPERATURE, \*LIQUIDS, \*PRECURSORS, \*BINARY COMPOUNDS, \*MICROSTRUCTURE, ARCHITECTURE, CHEMISTRY, COATINGS, CRYSTAL STRUCTURE, CRYSTALLIZATION, DIFFUSION, ELECTRONICS, HEATING, INORGANIC MATERIALS, LAYERS, MATERIALS, MECHANICS, PHASE, PROCESSING, RINGS, SINGLE CRYSTALS, SOLID SOLUTIONS, SOLIDIFICATION, STRIP TRANSMISSION LINES, STRUCTURES, SUBSTRATES, SYNTHESIS, TEMPERATURE, THIN FILMS, VAPOR PHASES, METASTABLE STATE, EQUILIBRIUM(GENERAL), CERAMIC MATERIALS, COMPOSITE MATERIALS, OPTICAL PROPERTIES, EPITAXIAL GROWTH, ZIRCONIUM, OXIDES, ALUMINUM, SOLID STATE CHEMISTRY, CHEMICAL COMPOSITION.

IDENTIFIERS: (U) WUAFOSR2306BS, Spin coating

AD-A283 959 11/6.1 20/11 20/2 7/2

ILLINOIS INST OF TECH CHICAGO DEPT OF METALLURGICAL AND MATERIALS ENGINEERING

(U) Processing and Characterization of Mechanically Alloyed NiAl-Based Alloys.

DESCRIPTIVE NOTE: Final rept. 15 Feb 90-30 Jun 94,

JUL 94 85P

PERSONAL AUTHORS: Dollar, Marek; Nash, Philip; Dymek, Stanislaw; Hwang, Seung-Joon; Suh, Sung-Jae

REPORT NO. 5-54718-1

CONTRACT NO. AFOSR-90-0152B

MONITOR: AFOSR, XC  
TR-94-0545, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) Mechanical alloying of powders followed by hot extrusion has been used to produce NiAl-based materials. The technique is capable of producing fully dense, free of cracks, fine grained materials containing a bimodal distribution of aluminum oxide dispersoids. The mechanically alloyed materials produced in our laboratory are much stronger at both ambient and elevated temperatures and significantly more ductile than their cast counterparts. Minimum creep rates in the MA NiAl are on average three orders of magnitude lower than that in their cast counterparts. The creep resistance of the MA NiAl is better than that of solid solution- and other dispersion-strengthened NiAl and comparable to the creep resistance of precipitation-strengthened NiAl. Improved mechanical properties of the present materials result from their unique microstructure. Mechanical alloying, NiAl-Aluminides, Intermetallics strength, Ductility and creep in NiAl

DESCRIPTORS: (U) \*ALUMINIDES, \*EXTRUSION, \*FINE GRAINED MATERIALS, \*MECHANICAL PROPERTIES, \*POWDERS, \*NICKEL ALLOYS, ALUMINUM OXIDES, CRACKS, CREEP, DISPERSIONS, DISTRIBUTION, DUCTILITY, MATERIALS, MICROSTRUCTURE, OXIDES, PRECIPITATION, RATES, RESISTANCE, SOLID SOLUTIONS, TEMPERATURE, PROCESSING, INTERMETALLIC COMPOUNDS.

AD-A283 960

AD-A283 959

UNCLASSIFIED

PAGE 63

T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A283 959 CONTINUED  
IDENTIFIERS: (U) Bimodal

AD-A283 958 7/6 20/6 20/5

CALIFORNIA UNIV SANTA BARBARA INST FOR POLYMERS AND  
ORGANIC SOLIDS

(U) Conjugated Polymers with Degenerate Ground State: The  
Route to High Performance NLO Response. (F91 ASSERT).

DESCRIPTIVE NOTE: Annual technical rept. no. 2, 1 Jun 93-  
31 May 94,

MAY 94 8P

PERSONAL AUTHORS: Heeger, Alan J.

CONTRACT NO. F49620-92-J-0267

PROJECT NO. 3484

TASK NO. S2

MONITOR: AFOSR, XC  
TR-94-0540, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) Following the completion of the thesis  
research of Dr. Craig Halvorson, a new graduate student,  
Jon McElvain, has been supported under this AFOSR ASSERT  
program. McElvain has focused his attention on the THG  
spectra of a number of polymers synthesized under the  
AFOSR program.

DESCRIPTORS: (U) \*POLYMERS, \*GROUND STATE, \*NONLINEAR  
OPTICS, SPECTRA, THESES, THIN FILMS, ANISOTROPY,  
SYNTHESIS.

IDENTIFIERS: (U) PE61103D, WUAFOSR3484S2, \*Conjugated,  
\*Degenerate

AD-A283 959

AD-A283 958

UNCLASSIFIED

PAGE 64 T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A283 957 CONTINUED

MICHIGAN UNIV ANN ARBOR

(U) Interface Mechanics of Particulate Media with Ribbed Inclusions.

DESCRIPTIVE NOTE: Final rept. 1 Apr 92-14 Jan 94,

JUN 94 38P

PERSONAL AUTHORS: Hryciw, Roman D.; Raschke, Scott A.;  
Irsyam, Masyhur

REPORT NO. UMCEE-94-19

CONTRACT NO. F49620-92-J-0216

PROJECT NO. 2302

TASK NO. CS

MONITOR: AFOSR, XC  
TR-94-0478, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) A large half-axisymmetric triaxial apparatus for studying the pullout resistance and interface mechanics of cylindrical ribbed inclusions in particulate material (soil) was designed, constructed and tested. The unusual geometry was needed to facilitate visual observation of grain motions, the changing soil fabric and shear band development around the inclusions. Initially, it will provide verification of a previously developed plasticity model for soil-ribbed inclusion interaction. The model is based on the development of passive soil resistance to advancing ribs in a plane strain geometry. The results of these plane strain observations are presented. While the model has been theoretically extended to cylindrical inclusions, experimental verification, including the observation of soil grain behavior in the vicinity of ribs, has hitherto not been conducted. Computer visualization hardware and software for tracking the displacements and rotations of individual particles has been developed. The system includes a computer workstation, a laser video disk recorder and digitizing boards. The software was written at the University of New Mexico and modified for the testing program at the University of Michigan. A CCD

AD-A283 957

AD-A283 957

UNCLASSIFIED

PAGE 65

T4035K

Video camera and bellows system allow for 1:10 to 5:1 magnifications. Various combinations of opaque dyes and color filters optimize the visual data collection while computer enhancement prepares the data for edge detection and particle tracking. Particulate media, Computer vision, Experimental micromechanics

DESCRIPTORS: (U) \*INCLUSIONS, \*INTERFACES, \*MECHANICS, \*PARTICULATES, AUGMENTATION, AXISYMMETRIC, BELLOWS, CAMERAS, CHARGE COUPLED DEVICES, COLLECTION, COLORS, COMPUTER VISION, DETECTION, DISKS, DISPLACEMENT, DYES, EDGES, FABRICS, FILTERS, GEOMETRY, LASERS, MATERIALS, MEDIA, MICROMECHANICS, MODELS, MOTION, OBSERVATION, PARTICLES, PLASTIC PROPERTIES, RECORDING SYSTEMS, RESISTANCE, RIBS, SOILS, TRACKING, VERIFICATION, VISION, STRAIN(MECHANICS), SAND.

IDENTIFIERS: (U) WUAFOSR2302CS, \*Ribbed, Cylindrical, Grain motions, Shear band, Passive, Video disk recorders, Digitizing boards, Opaque, Triaxial apparatus



UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A283 956 6/4 12/5

AD-A283 956 CONTINUED

BRIGHAM AND WOMEN'S HOSPITAL BOSTON MA

\*COMPUTER PROGRAMS, CHANNELS, COMPUTERS, DIAGRAMS, HUMANS, INPUT, MODELS, NOISE, OBSERVERS, SIMULATION, STANDARDS, STRUCTURES, VELOCITY, VISUAL ACUITY, AIRCRAFT.

(U) Developing Guided Search 3.0. The Next Generation of a Model Visual Search.

IDENTIFIERS: (U) WUAFOSR2313AS.

DESCRIPTIVE NOTE: Annual rept. Jun 93-Jun 94,

JUL 94 7P

PERSONAL AUTHORS: Wolfe, Jeremy M.

CONTRACT NO. AFOSR-93-1-0407

PROJECT NO. 2313

TASK NO. AS

MONITOR: AFOSR, XC  
TR-94-0541, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) There are numerous situations, from picking fruit to flying a plane, that require an observer to find a target item in a field filled with distracting items. Guided Search (GS) is our model of this visual search process. This project aims to develop the next generation of that model. In the past year, progress has been made in three areas: (1) The GS computer simulation has been improved, notably by equipping it with the ability to learn how to select useful information from the available input channels. (2) Our study of individual differences between subjects indicates that the differences revealed by standard search paradigms are probably mere noise. However, we can modify the usual paradigm by using larger display set sizes. This produces reliable individual differences that can be used to evaluate theories of search. (3) There are many tasks that require search through visually complex technical information. Using electrical diagrams as an example, we have developed techniques to speed search by graphical recoding of diagram information. We do this while preserving the standard structure of the diagrams. Our goal is 'hybrid search' in which human and computer both contribute to the success of the search.

DESCRIPTORS: (U) \*FRUITS, \*TARGETS, \*VISUAL TARGETS,

AD-A283 956

AD-A283 956

UNCLASSIFIED

PAGE 56 T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A283 948 CONTINUED

CASE WESTERN RESERVE UNIV CLEVELAND OH DEPT OF PHYSICS

(U) Thermal Relaxation Processes and Stability in Poled Electro-Optic Polymers.

DESCRIPTIVE NOTE: Annual rept. 1 Jul 93-30 Jun 94,

JUN 94 8P

PERSONAL AUTHORS: Singer, Kenneth D.

CONTRACT NO. F49620-93-1-0202

PROJECT NO. 2303

TASK NO. CS

MONITOR: AFOSR, XC  
TR-94-0543, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) We have made important progress in the last year in modeling the decay of molecular orientation in poled electro-optic materials in order to more accurately predict the evolution of the nonlinear optical response over time and are approaching a predictive description of the long time scale orientational decay of poled polymer systems. The most remarkable feature of decay measurements of the nonlinear optical response is that it appears similar over so many time scales. The breadth of the time scales involved can exceed those normally measured in dielectric relaxation measurements. Models have been developed in the dielectric literature to describe relaxation processes measured over many decades of time (or frequency). These models describe the dispersive and fractal time nature of these processes, and involve an extra parameter beyond that of a stretched exponential. Thus, one parameter defines an average time (frequency), and two describe the shape of the distribution of relaxation time (frequencies) above and below the average. An example of these models includes the Havriliak-Nagami model. We have begun to analyze our current data in light of these new models, and are developing programs to take transforms between the time and frequency domain to relate dielectric measurements to nonlinear optical.

DESCRIPTORS: (U) \*POLYMERS, \*RELAXATION TIME, \*ELECTROOPTICS, \*THERMAL PROPERTIES, DECAY, DIELECTRICS, DISTRIBUTION, FRACTALS, FREQUENCY, FREQUENCY DOMAIN, LIGHT, MATERIALS, MEASUREMENT, MODELS, OPTICS, PARAMETERS, RESPONSE, SCALE, SHAPE, TIME, STABILITY, MOLECULAR STRUCTURE, NONLINEAR OPTICS, DISPERSIONS, LASERS.

IDENTIFIERS: (U) WUAFOSR2303CS, PES1102F, \*Poled

AD-A283 948

AD-A283 948

UNCLASSIFIED

PAGE 67

T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. T4035K

AD-A283 338 20/10

AD-A283 200 20/6 9/5 6/5

SCIENTIFIC RESEARCH ASSOCIATES INC GLASTONBURY CT

UNIVERSITY OF CENTRAL FLORIDA ORLANDO

(U) Large Signal Time Dependent Quantum Mechanical Transport in Quantum Phase Based Devices.

(U) Time-Resolved, High-Resolution, X-Ray Microscopy of In-Vitro Biological and Life Science Specimens with the Aid of Laser Plasmas.

DESCRIPTIVE NOTE: Final rept. 15 Dec 90-15 Feb 94,

DESCRIPTIVE NOTE: Final rept. 1 Apr 93-31 Mar 94,

JUN 94 245P

JUN 94 50P

PERSONAL AUTHORS: Grubin, Harold L.

PERSONAL AUTHORS: Richardson, Martin

REPORT NO. R9133-F

CONTRACT NO. F49620-91-C-0016

CONTRACT NO. F49620-93-1-0148

MONITOR: AFOSR, XC

TR-94-0453, AFOSR

UNCLASSIFIED REPORT

MONITOR: AFOSR, XC

TR-94-0449, AFOSR

ABSTRACT: (U) This document summarizes studies performed under AFOSR Contract: F49620-91-C-0016. In this study equilibrium and nonequilibrium electron and hole transport in quantum scale structures were studied via solutions to the quantum Liouville equation in the coordinate representation. The coordinate representation density matrix solutions are the first to provide the quantum distribution function for electrons and holes in nanoscale devices coupled to model dependent dissipation. Illustrations of the use of the algorithm for quantum and classical devices are presented. A discussion of the quantum hydrodynamic equations is included because of its importance in studying dissipation. A summary of the transient studies and the initiation of two-dimensional studies is also discussed. A considerable number of publications have emerged from this study, all of which are included in this document. Quantum transport, Liouville equation, Resonant tunnelling, Dissipation, Density matrix, Transient.

UNCLASSIFIED REPORT

ABSTRACT: (U) The intent of this contract was to help create an x-ray microscopy facility at the Laser Plasma Laboratory at CREOL specially dedicated to applications to biology. The hope of this contract was that, in setting up a dedicated facility here in the US, we might attract the collaboration of medical and biological researchers, and thereby demonstrate the usefulness of this form of x-ray analysis. Hopefully then further development of this approach could then be supported by research funds from the medical and biological sciences. We have been successful in this endeavor. We have established a facility for biological microscopy. This facility will soon be a dedicated facility to this activity. We have produced our own x-ray images of biological specimens. Most encouragingly, we have formed collaboration with several groups of biologists and medical scientists to exploit this technology further.

DESCRIPTORS: (U) \*QUANTUM ELECTRONICS, ALGORITHMS, CONTRACTS, COORDINATES, DENSITY, DISSIPATION, DISTRIBUTION FUNCTIONS, DOCUMENTS, ELECTRONS, HYDRODYNAMICS, LIOUVILLE EQUATION, MODELS, NUMBERS, SCALE, STRUCTURES, TRANSIENTS, TRANSPORT, TWO DIMENSIONAL.

DESCRIPTORS: (U) \*ELECTROOPTICS, \*MICROSCOPY, CONTRACTS, FACILITIES, LABORATORIES, IMAGE PROCESSING, LASERS, X RAYS, X RAY DIAGNOSTICS, IN VITRO ANALYSIS, HIGH RESOLUTION, LASER APPLICATIONS, MEDICAL RESEARCH, CHROMOSOMES.

IDENTIFIERS: (U) WUAFOSR2301BS, PE61102F, X Ray

AD-A283 338

AD-A283 200

UNCLASSIFIED

PAGE 58 T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A283 200 CONTINUED  
microscopy

AD-A283 195 18/2 7/3

COLUMBIA UNIV NEW YORK DEPT OF CHEMISTRY

(U) Exchange Interaction in Micellized Radical Pairs.

DESCRIPTIVE NOTE: Scientific rept. 1991-92,

93 11P

PERSONAL AUTHORS: Tarasov, Valery F.; Ghatlia, Naresh D.;  
Avdievich, Nikolai I.; Turro, Nicholas J.

CONTRACT NO. AFOSR-91-0340

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR, XC  
TR-94-0441, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The Recombination probabilities of primary geminate triplet radical pairs, separation of (13)C/(12)C isotopes due to the magnetic isotope effect in the recombination reactions, the magnetic field dependence of (13)C chemically induced dynamic nuclear polarization in the recombination products of micellized radical pairs, magnetic field effects and stimulated nuclear polarization have been investigated in alkyl sulfate micelles of different sizes. The four characteristics that are relevant to the discussion of the behavior of the radical pair are: the micelle size; the penetrability of the micelle boundary; the distance dependence of the electron-electron exchange interaction; and the dependence of the microviscosity of the micellar core on the micellary size. Computer simulations unambiguously show that only an explicit consideration of the distance dependent electron spin exchange allows for a qualitative and quantitative reproduction of the experimental data. However, the geometric factors including the penetrability of the micelle boundary and the dependence of the viscosity of the micellar core on the micelle size are not important. Omission of any of these parameters from the simulations leads to the disappearance of even qualitative similarities. Magnetic isotope effect, Magnetic field effects, Micelles

AD-A283 200

AD-A283 195

UNCLASSIFIED

PAGE 69

T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A283 195 CONTINUED

AD-A283 194 20/5 7/2

DESCRIPTORS: (U) \*ISOTOPE EFFECT, \*CARBON, BOUNDARIES, CORES, EXPERIMENTAL DATA, INTERACTIONS, MAGNETIC FIELDS, PARAMETERS, POLARIZATION, RECOMBINATION REACTIONS, REPRODUCTION, SULFATES, VISCOSITY, ALKYL RADICALS, PHOTOLYSIS, NUCLEAR MAGNETIC RESONANCE, BENZOIN, COMPUTERIZED SIMULATION, ISOTOPE SEPARATION, ELECTRON SPIN RESONANCE, REPRINTS.

GEORGIA UNIV ATHENS DEPT OF CHEMISTRY

(U) Photodissociation Spectroscopy of Mg+ -Rare Gas Complexes,

JUN 94 13P

PERSONAL AUTHORS: Pilgrim, J. S.; Yeh, C. S.; Berry, K. R.; Duncan, M. A.

CONTRACT NO. AFOSR-91-0001

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR, XC  
TR-94-0439, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Jnl. of Chemical Physics, v100 n11, p7945-7956, 1 Jun 94. Available to DTIC users only. No copies furnished by NTIS.

ABSTRACT: (U) Mg(+/-) rare gas complexes (where Rg=Ar, Kr, Xe) are produced in a pulsed nozzle cluster source. The clusters are mass-selected in a reflectron time-of-flight mass spectrometer and studied with photodissociation spectroscopy. vibrationally resolved spectra are observed which provide the vibrational constants and dissociation energies for these complexes. Spin-orbit multiplets are observed to vary over the series of rare gases. Clusters, Electronic spectroscopy, Photodissociation

DESCRIPTORS: (U) \*RARE GASES, \*MAGNESIUM, \*ION MOLECULE INTERACTIONS, FLIGHT, MASS SPECTROMETERS, NOZZLE CLUSTERS, PHOTODISSOCIATION, SPECTRA, ATOMIC SPECTROSCOPY, SPIN RESONANCE, MOLECULAR VIBRATION, METAL COMPLEXES, MOLECULAR COMPLEXES, EXCITATION, MOLECULAR STATES, REPRINTS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303A3

AD-A283 195

AD-A283 194

UNCLASSIFIED

PAGE

70

T4035K

## UNCLASSIFIED

AD-A283 184 7/3 6/1 7/5 DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K  
AD-A283 184 CONTINUED

COLUMBIA UNIV NEW YORK DEPT OF CHEMISTRY

(U) Electron Transport Reactions between Pyrene and Methylviologen in a Model Biological Membrane.

DESCRIPTIVE NOTE: Scientific rept. 1993-94,

94 8P

PERSONAL AUTHORS: Aikawa, Masayuki; Turro, Nicholas J.;  
Ishiguro, Katsuya

CONTRACT NO. AFOSR-91-0340

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR, XC  
TR-94-0440, AFOSR

## UNCLASSIFIED REPORT

Availability: Pub. in Chemical Physics Letters, v222 p197-203, 1994. Available to DTIC users only. No copies furnished by NTIS.

ABSTRACT: (U) Electron transport reactions in a phospholipid vesicle solution have been investigated by time-resolved laser spectroscopy. Photoelectrons were produced by two-photon absorption of the pyrene chromophore adsorbed in a model membrane (vesicle) and were captured either by bound pyrene, which was covalently attached to the surfactant molecule anchored in the hydrophobic layer of the membrane, or by methylviologen which was located in the outer water phase of the vesicle solution. The lifetimes and yields of pyrene fluorescence and of the lowest pyrene triplet state were not affected by the addition of methylviologen. Electron transfer, Micelles, Vesicles, Fluorescence

DESCRIPTORS: (U) \*ELECTRON TRANSPORT, \*PHOSPHOLIPIDS, \*TWO PHOTON ABSORPTION, CHROMOPHORES, ELECTRON TRANSFER, FLUORESCENCE, LASERS, PHOTOELECTRONS, SURFACE ACTIVE SUBSTANCES, WATER, PHOTOCHEMICAL REACTIONS, SUBSTITUTION REACTIONS, SOLUBILITY, MEMBRANES(BIOLOGY), CONCENTRATION(COMPOSITION), RADIOLYSIS, TRANSIENTS, EXCITATION, STOICHIOMETRY, REPRINTS.

AD-A283 184

AD-A283 184

UNCLASSIFIED

PAGE

71

T4035K

UNCLASSIFIED

## DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. T4035K

AD-A283 181 20/5 7/2

AD-A283 180 6/4 6/5 6/10

CALIFORNIA INST OF TECH PASADENA

CHICAGO UNIV IL DEPT OF MEDICINE

(U) Fundamental Studies of a High Energy Molecular System: Spectroscopy of Boron in Hydrogen Clusters. ASSERT-92.

(U) Basic Mechanisms and Implications of Non-Photoc Entrainment of Circadian Rhythmicity.

DESCRIPTIVE NOTE: Annual rept. no. 1, 1 Jun 93-31 May 94,

DESCRIPTIVE NOTE: Annual rept. 1 Sep 92-31 Aug 93,

JUN 94 3P

AUG 93 5P

PERSONAL AUTHORS: Okumura, Mitchio

PERSONAL AUTHORS: Van Cauter, Eve

CONTRACT NO. F49620-93-1-0326

CONTRACT NO. F49620-92-J-0347

PROJECT NO. 3484

PROJECT NO. 3484

TASK NO. XS

TASK NO. S4

MONITOR: AFOSR, XC  
TR-94-0445, AFOSRMONITOR: AFOSR, XC  
TR-94-0451, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) The graduate student and the undergraduates supported by this AASERT award have designed and fabricated a molecular beam spectroscopy apparatus for the study of metal-hydrogen complexes. This instrument is necessary for accomplishing the tasks set out for both the parent award and the AASERT grant. The students have also aided in the design of both a novel cryogenically-cooled laser vaporization source and a second chamber, currently being fabricated, for resonant multiphoton ionization spectroscopy. They have optimized the collection of UV laser-induced fluorescence spectra using a free jet expansion of benzene, and are now beginning their first studies of metal-hydrogen systems with the prototype HEDM system A1.H2

DESCRIPTORS: (U) \*MOLECULAR SPECTROSCOPY, \*LASER INDUCED FLUORESCENCE, BENZENE, EXPANSION, BORON, CLUSTERING, HIGH ENERGY, HYDROGEN, IONIZATION, MOLECULAR BEAMS, PROTOTYPES, MOLECULAR COMPLEXES, EXPERIMENTAL DESIGN, ULTRAVIOLET LASERS, VAPORIZATION, EXPERIMENTAL DESIGN, OPTICAL DETECTION, VACUUM CHAMBERS.

IDENTIFIERS: (U) WUAFOSR3484XS, PE61103D, Free jet expansion

AD-A283 181

AD-A283 180

UNCLASSIFIED

PAGE

72

T4035K

ABSTRACT: (U) The studies showed that afternoon exposure to exercise increases TSH levels and tends to delay the onset of nocturnal TSH secretion on the following night. Analysis of the melatonin levels is under progress. Mr Trabb learned to recruit, screen and supervise research volunteers, to record EEG activity, and all the basic skills of clinical research. He also participated in studies examining the effects of carbohydrate intake on vigilance and performance. Mr Salchli was responsible for incorporating the new computerized data collection and analysis system into the laboratory. His computer skills were vital in allowing the laboratory to begin using this new system. He used this system to determine the phase, shifting effects of light pulses of varying intensity on the free-running circadian rhythm of locomotor activity in both young and old hamsters. He was able to demonstrate that old hamsters are about 20 times less sensitive to the effects of light on the circadian clock, despite there being little if any effect of age on the amount of light being transmitted through the eyes

DESCRIPTORS: (U) \*CIRCADIAN RHYTHMS, \*EXERCISE(PHYSIOLOGY), CARBOHYDRATES, SENSITIVITY, EYE, HAMSTERS, INTENSITY, RESPONSE(BIOLOGY), MUTATIONS, PHASE SHIFT, LOCOMOTION, LIGHT PULSES, MELATONIN, NIGHT, AGING(PHYSIOLOGY), MEDICAL RESEARCH, SECRETION, VIGILANCE,



UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A283 180 CONTINUED  
VOLUNTEERS.

AD-A282 996 20/3 20/13 11/2

CRYOPOWER ASSOCIATES LOS ALAMOS NM

IDENTIFIERS: (U) PE61103D, WUAFOSR3484S4

(U) High Temperature Superconductors with Improved Current Densities.

DESCRIPTIVE NOTE: Final rept. 1 Jul 91-30 Jun 93,

JUN 94 13P

PERSONAL AUTHORS: Laquer, H. L.

CONTRACT NO. F49620-91-C-0065

PROJECT NO. 1602

TASK NO. 01

MONITOR: AFOSR, XC  
TR-94-0467, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) We have developed a novel technique for processing bulk high temperature superconductors and other ceramics under precisely controlled conditions of pressure, temperature, atmospheric composition, and strain rate. We achieve essentially uni-axial deformation of a pre-compacted disc inside a bellows-like capsule with massive end plates or 'anvils'. The capsule is located inside a Hot Isostatic Press (HIP), but has an independent gas supply. This makes it possible to maintain a specified gaseous atmosphere within the capsule and exert considerable forces on its contents via the anvils, simply by manipulating the two gas pressures. We call the process Differential Pressure HIP Forging, or DPHF, and are filing a patent application on the modifications to the, otherwise, conventional apparatus. DPHF opens a new regime for processing sensitive materials at elevated pressures and temperatures

DESCRIPTORS: (U) \*HIGH TEMPERATURE, \*CURRENT DENSITY, ATMOSPHERES, ATMOSPHERICS, DEFORMATION, FORGING, HIGH TEMPERATURE SUPERCONDUCTORS, MATERIALS, MODIFICATION, PATENT APPLICATIONS, PATENTS, PLATES, PRESSURE, PROCESSING, RATES, STRAIN RATE, SUPERCONDUCTORS, SUPPLIES, TEMPERATURE.

IDENTIFIERS: (U) PE63218C, WUAFOSR160201, Uniaxial, Pre-

AD-A282 996

AD-A283 180

UNCLASSIFIED

PAGE 73 T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. T4035K

AD-A282 996 CONTINUED

AD-A282 971 11/6.1 20/11 7/2

compacted disc, Bellows like capsule, Anvils, End plates,  
HIP(Hot Isostatic Press)

VIRGINIA UNIV CHARLOTTEVILLE DEPT OF MATERIALS SCIENCE  
AND ENGINEERING

- (U) Fundamental Concepts Relating Local Atomic  
Arrangements, Deformation, and Fracture of  
Intermetallic Alloys.

DESCRIPTIVE NOTE: Final rept. Apr 93-31 Mar 94,

APR 94 119P

PERSONAL AUTHORS: Wert, J. A.

REPORT NO. UVA/525771/MSE94/101

CONTRACT NO. F49620-93-1-0245

MONITOR: AFOSR, XC  
TR-94-0472, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The creep resistance of a TiAl/Ti3Al alloy with a lamellar microstructure has been previously found to be superior to the creep resistance of single-phase TiAl and Ti3Al alloys with compositions close to the compositions of the individual phases in the lamellar alloy. The objectives of the present research project were to identify the origin of the enhanced creep resistance of the TiAl/Ti3Al lamellar alloy, to formulate a model capable of predicting the creep strength of the TiAl/Ti3Al lamellar alloy, and to evaluate the effect of thermal exposure on the creep strength of the TiAl/Ti3Al lamellar alloy. The results, analyses and interpretations described in this report show that the enhanced creep resistance of the TiAl/Ti3Al lamellar alloy arises from the lamellar morphology of the TiAl and Ti3Al phases. The lamellar morphology provides a large interphase interfacial area per unit volume, which is proposed to introduce a high density of dislocation sources. The high density of dislocation sources is thought to increase the work hardening rate of the lamellar alloy relative to the individual single phase alloys; an effect which contributes the small primary creep strain and low secondary creep rate exhibited by the lamellar alloy. When the increased work hardening rate is accounted for in the constitutive equations for creep of the individual TiAl and Ti3Al phases, an analytical model formulated for

AD-A282 996

AD-A282 971

UNCLASSIFIED

PAGE

74

T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. T4035K

AD-A282 971 CONTINUED

AD-A282 969 11/8 11/2

creep of discontinuous, lamellar-reinforced composites can be used to predict the creep strength of the TiAl/Ti3Al lamellar alloy from the creep properties of the single phase alloys. TiAl, Ti3Al, Intermetallic, Creep, Lamellar composite, Constitutive model, Coarsening

DESCRIPTORS: (U) \*ALLOYS, \*INTERMETALLIC COMPOUNDS, \*FRACTURE(MECHANICS), \*DEFORMATION, \*ATOMIC STRUCTURE, CREEP, CREEP STRENGTH, DEGRADATION, DENSITY, DISLOCATIONS, EQUATIONS, HARDENING, HIGH DENSITY, MICROSTRUCTURE, MODELS, MORPHOLOGY, PHASE, RATES, RESISTANCE, SECONDARY, TEMPERATURE, VOLUME, TITANIUM ALUMINIDE, THERMAL PROPERTIES, STRAIN(MECHANICS), COMPOSITE MATERIALS, REINFORCING MATERIALS.

IDENTIFIERS: (U) \*Lamellar, Coarsening, Constitutive model, Discontinuous

ILLINOIS UNIV AT URBANA

(U) Materials Degradation and Fatigue Under Extreme Conditions.

DESCRIPTIVE NOTE: Annual rept. 1 Apr 93-31 Mar 94,

MAR 94 10P

PERSONAL AUTHORS: Jonas, Jiri

CONTRACT NO. F49620-93-1-0241

PROJECT NO. 3484

TASK NO. CS

MONITOR: AFOSR, XC  
TR-94-0446, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) As outlined in the original proposal our work deals with NMR and laser Raman scattering experiments on highly viscous liquids, including lubricants, both in bulk and confined geometries, over a wide range of pressures and temperatures. In a general sense we focus on the relationship between molecular level properties as obtained from our experiments and the macroscopic properties of the fluid studied, including fluids at the fluid-solid interface. As continuation of our systematic efforts to improve the understanding of the dynamic behavior of confined fluids we carried out NMR relaxation experiments on a number of molecular fluids including model lubricants. Of particular interest are the unique experiments dealing with pressure effects on confined liquids. As far as the development of new instrumentation is concerned we designed and fabricated NMR probes and pressure generating systems which allow measurements up to 10kbar pressures

DESCRIPTORS: (U) \*LUBRICANTS, \*FATIGUE(MECHANICS), \*SILICA GLASS, DEGRADATION, VISCOSITY, POROSITY, PRESSURE, TEMPERATURE, LASERS, SCATTERING.

IDENTIFIERS: (U) PE61103D, WUAFOSR3484CS, Sol gel, Laser raman spectroscopy

AD-A282 971

AD-A282 969

UNCLASSIFIED

PAGE 75

T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A282 946 7/1 11/4 20/6 7/2 AD-A282 946 CONTINUED

CALIFORNIA UNIV LOS ANGELES DEPT OF MATERIALS SCIENCE  
AND ENGINEERING

COMPOSITE MATERIALS, BORON COMPOUNDS.

(U) International Collaboration Program in Innovative  
Chemical Processing of Superior Electronic and Optical  
Materials.

IDENTIFIERS: (U) \*Quantum dots, Borosilicate gel,  
Ormosil

DESCRIPTIVE NOTE: Annual rept. 15 May 92-14 May 93,

JUN 93 17P

PERSONAL AUTHORS: Mackenzie, John D.

CONTRACT NO. AFOSR-91-0317

MONITOR: AFOSR, XC  
TR-94-0431, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) Cadmium sulfide quantum dot materials are promising candidates for many nonlinear optical applications, because of their high third-order nonlinear susceptibilities. The UCLA teams has been collaborating with the University of Arizona and the Tokyo Institute of Technology in the fabrication and testing of such materials. Two processing techniques were used. The first one involved the preparation of a sodium borosilicate gel containing Cd salts. The gel was converted to dense glass at 550 degree and the Cd salt to CdS. The second one involved the use of Ormosil (organically modified silicate) as the matrix containing CdS microcrystals. A new method was developed to anchor the Cd salts onto the gel matrix so that subsequently, the CdS distribution in the matrix became highly uniform. Samples containing in excess of 10 wt.% of CdS were prepared with X(3) values up to 10-8 e.s.u. with practically no photodarkening effects. The sodium borosilicate glass samples were fabricated into channel waveguides by sodium to potassium ion-exchange

DESCRIPTORS: (U) \*CADMIUM SULFIDES, \*COMPOSITE MATERIALS, \*CHEMICAL ENGINEERING, \*ELECTRONICS, \*OPTICAL MATERIALS, ANCHORS, CHANNELS, DISTRIBUTION, EXCHANGE, FABRICATION, GELS, GLASS, ION EXCHANGE, IONS, MATERIALS, POTASSIUM, PREPARATION, PROCESSING, SALTS, SILICATES, SODIUM, UNIFORMS, WAVEGUIDES, QUANTUM THEORY, NONLINEAR OPTICS, TEST AND EVALUATION, CRYSTALS, MATRIX MATERIALS,

AD-A282 946

AD-A282 946

UNCLASSIFIED

PAGE

76

T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A282 944 7/6

AD-A282 942 5/8

TEXAS UNIV AT AUSTIN

WISCONSIN UNIV-MADISON DEPT OF PSYCHOLOGY

(U) Polymer-Polymer Interactions.

(U) Processes Involved in the Integration of Pictures and Discourse.

DESCRIPTIVE NOTE: Final rept. 1 Oct 91-30 Jan 94,

DESCRIPTIVE NOTE: Annual rept. 1 Jun 93-31 May 94,

JAN 94 15P

JUN 93 3P

PERSONAL AUTHORS: Sanchez, Issac C.; Paul, Donald R.

PERSONAL AUTHORS: Glenberg, Arthur M.

CONTRACT NO. AFOSR-89-0479

CONTRACT NO. F49620-92-J-0310

PROJECT NO. 2303

PROJECT NO. 3484

TASK NO. CS

TASK NO. S4

MONITOR: AFOSR, XC

MONITOR: AFOSR, XC

TR-94-0424, AFOSR

TR-94-0469, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) Our approach for understanding polymer-polymer interactions is to measure heats of mixing of small molecule analogs. In particular, we have focused on small molecule analogs of polystyrene (PS) and poly (2,6 dimethyl phenylene oxide) (PPO). This well-known systems is miscible, but the origin of its miscibility has perplexed investigators for over 25 years. Our measurements and associated molecular mechanics/Monte Carlo calculations have firmly established that the two methyl groups on PPO play a significant role in affecting miscibility. We have developed two equations of state models for hydrogen bonding interactions. They represent a significant advance in our understanding of hydrogen bonding interactions in both polymeric and non-polymeric systems. The models have been successfully applied to a variety of systems that include supercritical fluids

DESCRIPTORS: (U) \*POLYMERS, FLUIDS, SUPERCRITICAL FLOW, SOLUBILITY, GAS DYNAMICS, CALORIMETRY, ISOMERS, INTERACTIONS, MIXING, MODELS, MOLECULES, HYDROGEN BONDS, COMPRESSION, OXIDES, POLYSTYRENE.

IDENTIFIERS: (U) PE61102F, WUAFOSR22303CS, Phenylenes

ABSTRACT: (U) From 7/93 to 6/94 William Langston and Douglas Kramer continued work on a series of experiments investigating the use of spatial mental models to notice relationships (between objects) that have not been mentioned in a text (the series of experiments headed Experiment 1 in the proposal). From 7/93 to 12/93 the experiments were conducted using sentence reading time as a dependent variable to determine if readers, take longer to process a sentence in which the objects referred to in the sentence are far from the locus of attention (in a mental model) compare to when the objects in the sentence are near to the locus of attention. Subjects performed a diagram verification task after reading each text to encourage formation of spatial mental models. From 1/94 to 5/94 the experiments were redesigned to investigate the phenomenon in simpler arrangements (because subjects were not showing a noticing effect in the more complex design). For these experiments, subjects were asked to read texts describing a spatial arrangement of three objects. A manuscript describing the results of these experiments is currently in preparation. Also, this work was reported in Langston, W., Glenberg, A.M. Kramer, D.C. (1994) Mental models are not (very) spatial. Paper presented at the EARLI conference, Helsinki, Finland, June 1994, and in a colloquium given by Arthur Glenberg at the University of Minnesota.

AD-A282 944

AD-A282 942

UNCLASSIFIED

PAGE 77

T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. T4035K

AD-A282 942 CONTINUED

AD-A282 941 1/1 20/4 20/13 7/4

CALIFORNIA INST OF TECH PASADENA GRADUATE AERONAUTICAL LABS

DESCRIPTORS: (U) \*COMPREHENSION, \*MENTAL ABILITY, ATTENTION, DIAGRAMS, READING, VARIABLES, VERIFICATION, PSYCHOPHYSIOLOGY.

(U) Interaction of Chemistry, Turbulence, and Shock Waves in Hypervelocity Flow.

IDENTIFIERS: (U) PE61103D, WUAFOSR3484S4.

DESCRIPTIVE NOTE: Annual technical rept. 15 May 93-14 May 94,

MAY 94 67P

PERSONAL AUTHORS: Candler, G. V.; Dimotakis, P. E.; Hornung, H. G.; Leonard, A.; Meiron, D. I.

REPORT NO. GALT-FM-94-2

CONTRACT NO. F49620-93-1-0338

PROJECT NO. 3484

TASK NO. AS

MONITOR: AFOSR, XC  
94-0448, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) Significant progress was made during the first year of an interdisciplinary experimental, numerical and theoretical program to extend the state of knowledge and understanding of the effects of chemical reactions in hypervelocity flows. The program addressed the key problems in aerothermochemistry that arise from interactions between the three strongly nonlinear effects: compressibility; vorticity; and chemistry. Important new results included: Experimental data on the effect of enthalpy on transition in hypervelocity flow. First visualization of high-enthalpy turbulent boundary layer structure; New data on hypervelocity flow over spheres, confirming computations and new theory; Progress on methods of parallel computation of shock-vortex interaction. New computations of three-dimensional leeward reacting flow; Development and tests of a greatly improved low-cost, thermocouple heat transfer gauge; Upgrade of the supersonic shear-layer facility to all-hyperbolic operation. Exploration of this regime with a new Rayleigh scattering method; Test of the validity of vibration-dissociation coupling models from shock tunnel

AD-A282 942

AD-A282 941

UNCLASSIFIED

PAGE

78

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DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. T4035K

AD-A282 941

CONTINUED

data; Successful application of new parallelized algorithm of the extended Schwinger multi-channel method to computation of electron-molecule collision cross-sections; and Prediction and realization of a new non-intrusive diagnostic method, laser-induced thermal acoustics, for accurate measurement of sound speed and bulk viscosity. Chemical reaction, Shock wave, Vorticity, Hypervelocity, Shock-vortex interaction, Heat transfer gauges, Laser scattering, Laser-induced thermal acoustics, Vibration-dissociation coupling

DESCRIPTORS: (U) \*CHEMICAL REACTIONS, \*TURBULENT BOUNDARY LAYER, \*HYPERSONIC FLOW, \*SUPERSONIC FLIGHT, ALGORITHMS, BOUNDARY LAYER, COLLISIONS, COMPRESSIVE PROPERTIES, COUPLINGS, CROSS SECTIONS, ELECTRONS, ENTHALPY, HEAT TRANSFER, LASERS, LOW COSTS, MODELS, MOLECULES, RAYLEIGH SCATTERING, SHOCK TUNNELS, SHOCK WAVES, SPHERES, TEST AND EVALUATION, THERMOCOUPLES, THREE DIMENSIONAL, VIBRATION, VISCOSITY, VORTICES, THREE DIMENSIONAL FLOW, ACOUSTIC VELOCITY, AEROTHERMODYNAMICS, HEAT TRANSFER, SHEAR FLOW, AERODYNAMIC CONTROL SURFACES.

IDENTIFIERS: (U) PE61103D, WUAFOSR3484AS, Vorticity

AD-A282 939

5/1

AIR FORCE OFFICE OF SCIENTIFIC RESEARCH BOLLING AFB DC

(U) Air Force Office of Scientific Research. Research Proposal, Quarterly Status Report October-December 1993.

DESCRIPTIVE NOTE: Quarterly status rept. no. 4.

OCT 93 57P

MONITOR: AFOSR, XC

TR-94-0426, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The Research Proposal Quarterly Status Report is published quarterly (March, June, September, and December), by the Air Force Office of Scientific Research (AFOSR). It lists all the research proposals received by AFOSR during the past six months along with the action taken (Initiated, Declined or Withdrawn on each report. The report is divided into two parts. The Institution Index lists proposals alphabetically by institution. This is followed by a more detailed listing by Directorate, and by Program Manager within the Directorate. This report is designed to inform other Government agencies of the proposals received by the AFOSR and the action taken on these proposals. Reader must keep in mind that declined proposals should not necessarily be considered as scientifically unacceptable; many declinations result from a lack of funds or as a result of special programmatic emphasis

DESCRIPTORS: (U) \*CONTRACT PROPOSALS, \*RESEARCH MANAGEMENT, \*AIR FORCE RESEARCH, REPORTS, AIR FORCE PLANNING.

AD-A282 941

AD-A282 939

UNCLASSIFIED

PAGE 79

T4035K



UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A282 938 5/8 5/9

AD-A282 938 CONTINUED

MARYLAND UNIV COLLEGE PARK OFFICE OF RESEARCH  
ADMINISTRATION AND ADVANCEMENT

CORRELATION, ERRORS, GRADUATES, GRANTS, HANDS, HYPOTHESES,  
MOTION, SCIENTISTS, STUDENTS, TEST AND EVALUATION, THESES,  
THRUST, TIME, VELOCITY, THREE DIMENSIONAL.

(U) Interdisciplinary Training in Life Sciences (FY91  
Assert).

IDENTIFIERS: (U) PE61103D, WUAFOSR3484S4, \*Neuroscience,  
\*Computer science

DESCRIPTIVE NOTE: Annual rept. 1 Jun 93-31 May 94,

JUN 94 3P

PERSONAL AUTHORS: Steinman, Robert

CONTRACT NO. FA9620-92-J-0260

PROJECT NO. 3484

TASK NO. S4

MONITOR: AFOSR, XC  
TR-94-0468, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) This grant supports the interdisciplinary training (psychology, neuroscience and computer science) of an advanced graduate student (Julie Epelboim), who is earning a PH.D. in Psychology by participating as a graduate Research Assistant on AFOSR Grant 91-0124, entitled 'Coordinated action in 3-D Space'. Her doctoral thesis will be derived from problems investigated in this 'parent' grant which has two main thrusts. First, it tests alternative hypotheses about the mechanism that controls the gaze-shifts associated with arm motions, when an unrestrained, seated subject manipulates objects within arms's reach. The second thrust is to study the speed and accuracy of visually-guided hand movements and the correlation of these performance measures with binocular gaze-errors. Advancing knowledge in this rather technical interdisciplinary research area requires developing expertise in the areas included in Epelboim's AASSERT training program, which has been designed so as to contribute to the goals of the parent grant and at the same time prepare her for a productive career as a research scientist during the next 3 or 4 decades. Training, Neuroscience, Cognitive science, Psychology

DESCRIPTORS: (U) \*COGNITION, \*PSYCHOLOGY, \*TRAINING,  
ACCURACY, BINOCULARS, CAREERS, COMPUTERS, CONTROL,

AD-A282 938

AD-A282 938

UNCLASSIFIED

PAGE

80

T4035K

## UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A282 930 CONTINUED

AD-A282 930 1/4 1/2

NETROLOGIC INC SAN DIEGO CA

(U) Microcomputer-Based Aircraft Routing and Scheduling.  
Phase 2.

DESCRIPTIVE NOTE: Final rept. 15 Sep 91-14 Sep 93.

JUN 94 164P

PERSONAL AUTHORS: Greenwood, Dan; Nygard, Kendall

CONTRACT NO. F49620-91-C-0078

MONITOR: AFOSR, XC  
TR-94-0422, AFOSR

## UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Prepared in cooperation with North Dakota State Univ., Fargo, Dept. of Computer Science and Operations Research.

ABSTRACT: (U) The work concerns research, development and software implementation of distributed mathematical optimization algorithms for aircraft routing and scheduling. Two Air Force application concerns customized short-term scheduling of military aircraft to support mission-critical passenger travel. The mission routing and scheduling procedures developed under the project were coded, and a graphical user interface was developed for prototype use by United States Air Forces in Europe at Ramstein AFB in Germany. In addition to the optimization procedures and the graphical user interface, a specialized underlying database management system was developed from scratch, to support an airport atlas and information pertaining to aircraft characteristics, traveling personnel, and other relevant information. The system runs UNIX workstation computers under the X-Window environment with Motif. The optimization model and distributed computing model were designed and developed to facilitate expansion into use for military passenger fleet units that are highly distributed geographically, setting the stage for strong coordination of airlift activities among multiple sites and different branches of the armed forces. The optimization approach is based on set partitioning, and uses global methods inspired by price-directive decomposition. Recent advances in artificial intelligence for distributed problem solving,

and recent capabilities in wide-area communication technology also play a role

DESCRIPTORS: (U) \*MILITARY AIRCRAFT, \*ROUTING, \*SCHEDULING, \*FLIGHT PATHS, \*MICROPROCESSORS, AIR FORCE, AIRPORTS, ALGORITHMS, APPROACH, ARTIFICIAL INTELLIGENCE, COMPUTERS, DATA BASES, DECOMPOSITION, ENVIRONMENTS, EUROPE, EXPANSION, GERMANY, GLOBAL, INTELLIGENCE, INTERFACES, MANAGEMENT, MISSIONS, MODELS, OPTIMIZATION, PASSENGERS, PERSONNEL, PROBLEM SOLVING, PROTOTYPES, SITES, TRAVEL, UNITED STATES, WINDOWS.

IDENTIFIERS: (U) \*Microcomputers

AD-A282 930

AD-A282 930

UNCLASSIFIED

PAGE 81

T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A282 928 6/4 12/9

AD-A282 928 CONTINUED

CALIFORNIA UNIV IRVINE DEPT OF COGNITIVE SCIENCES

(U) Visual Motion Perception and Visual Information Processing.  
IDENTIFIERS: (U) PE61102F, WUAFOSR2313AS, Depth perception, Motion detection

DESCRIPTIVE NOTE: Final rept. 1 Dec 93-28 Feb 94,

FEB 94 21P

PERSONAL AUTHORS: Sperling, George

CONTRACT NO. F49620-94-1-0073

PROJECT NO. 2313

TASK NO. AS

MONITOR: AFOSR, XC  
TR-94-0470, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) This final progress report summarizes the results of a study that successfully determined the functional architecture of visual motion perception, in the sense of defining the mechanisms involved and the relations between them. It was proved that visual motion is computed by two neural systems: primitive motion-energy extraction (e.g., Reichardt detector) and higher-level feature tracking. A psychophysical pedestal paradigm was used to exclude the feature-tracking process and thereby to obtain pure measures of motion-energy extraction. Motion energy extraction was found to be exclusively monocular, fast (cutoff frequency is 12 Hz) and sensitive (can utilize 0.2% contrast), 'bottom-up', and, to operate on both luminance (first-order) and contrast (second-order) motion stimuli. Motion feature tracking was found to operate interocularly as well as monocularly, have a cutoff frequency of 3 Hz, and to be both bottom up (it computes motion from luminance, contrast, depth, motion-motion, flicker and other type of stimuli) and top-down (e.g., attentional states influence what appears to move). The full report is appended.

DESCRIPTORS: (U) \*MOTION, \*VISUAL PERCEPTION, \*PATTERN RECOGNITION, \*ARTIFICIAL INTELLIGENCE, CONTRAST, DEPTH, FLICKER, LUMINANCE, PERCEPTION, STIMULI, TRACKING, NEURAL NETS, GRATINGS(SPECTRA), EYE, COGNITION.

AD-A282 928

AD-A282 928

UNCLASSIFIED

PAGE

82

T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. T4035K

AD-A282 912 20/4 12/1

AD-A282 855 7/4 20/3 7/2 7/3

VIRGINIA POLYTECHNIC INST AND STATE UNIV BLACKSBURG  
INTERDISCIPLINARY CENTER FOR APPLIED MATHEMATICS

COLUMBIA UNIV NEW YORK LOWELL MEMORIAL LIBRARY

(U) Computational Methods for PDEs in Flow Control,  
Superconductivity, Fluid Flows and Other Applications.

(U) Paramagnetic Interactions of Triplet Radical Pairs with  
Nitroxide Radicals: An 'Antiscavenging' Effect.

94 6P

DESCRIPTIVE NOTE: Final technical rept. 1 Dec 92-28 Feb  
94,

PERSONAL AUTHORS: Step, Eugene N.; Buchachenko, Anatoli  
L.; Turro, Nicholas J.

APR 94 27P

PERSONAL AUTHORS: Gunzburger, Max D.

CONTRACT NO. AFOSR-91-0340

CONTRACT NO. F49620-93-1-0061

PROJECT NO. 2303

MONITOR: AFOSR, XC  
TR-94-0429, AFOSR

TASK NO. B2

MONITOR: AFOSR, XC  
TR-94-0442, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) We give an overview of the research carried out under grant sponsorship and then give details concerning four of the problems we have worked on and for which we have obtained significant results. These are: least-squares finite element methods for incompressible, viscous flows; analysis of a shape control problem for the Navier-Stokes equations; finite dimensional approximation of a class of nonlinear optimal control problems; and feedback control of Karman vortex shedding. We then give lists of papers prepared and personnel supported under grant sponsorship. Least squares, Finite element methods, Flow control, Nonlinear control, Shape optimization

DESCRIPTORS: (U) \*VISCOUS FLOW, \*COMPUTATIONAL FLUID DYNAMICS, \*FINITE ELEMENT ANALYSIS, FEEDBACK, NAVIER STOKES EQUATIONS, OPTIMIZATION, VORTEX SHEDDING, INCOMPRESSIBLE FLOW, CONTROL THEORY, ALGORITHMS, SUPERCONDUCTIVITY, LEAST SQUARES METHOD, NONLINEAR ANALYSIS, BOUNDARY VALUE PROBLEMS, FLOW VISUALIZATION, COMPUTERIZED SIMULATION.

AD-A282 912

UNCLASSIFIED

PAGE 83

T4035K

Availability: Pub. in the Jnl. of the American Chemical Society, v116 n2 p5462-5466 1994. Available only to DTIC users. No copies furnished by NTIS.

ABSTRACT: (U) The recombination probability  $P$  sub  $r$ , of triplet sec-phenethyl/sec phenethylacyl radical pairs (RP) generated in the photolysis of d,1-2,4-diphenylpentan-3-one (d,1-DPP) in benzene increases from 0.033 to 0.098 as the concentration of the stable free radical, TEMPO, increases from 0 m to 0.145 M. The unusual effect of a putative free radical scavenger is explained in terms of a competition between two processes: chemical scavenging of geminate radicals by nitroxide, and spin exchange between geminate radicals and nitroxide. The second process is evidently faster and enhances triplet to singlet intersystem crossing of the geminate triplet RP. As a result  $P$  sub  $r$  increases as the concentration of the free radical scavenger, TEMPO, increases. These results reveal a peculiar situation for which a paramagnetic scavenger, by physically accelerating intersystem crossing faster than it scavenges, enhances the reactivity of a triplet geminate pair as it approaches. The new result is an increase in the cage effect or recombination efficiency of geminate radical pairs. These results allow a novel view of the cage effect of geminate pairs in homogeneous non-viscous solutions. Geminate radicals, Nitroxide, Paramagnetic scavenger, Cage effect

AD-A282 855

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A282 855 CONTINUED

AD-A282 840 7/2 7/4 9/3 20/5

VIRGINIA UNIV CHARLOTTESVILLE DEPT OF CHEMISTRY

DESCRIPTORS: (U) \*FREE RADICALS, \*PARAMAGNETISM, \*NITRO RADICALS, \*OXIDES, \*CARBON, BENZENE, CHEMICALS, COMPETITION, CROSSINGS, EFFICIENCY, EXCHANGE, PHOTOLYSIS, PROBABILITY, REACTIVITIES \*RECOMBINATION REACTIONS, MAGNETIC PROPERTIES, INTERACTIONS, CHEMICAL RADICALS, SPIN STATES, ELECTRONS, RANDOM WALK, REPRINTS.

(U) Boron Atom Matrix Chemistry.

DESCRIPTIVE NOTE: Annual rept. 1 Jun 93-31 May 94,

MAY 94 2P

IDENTIFIERS: (U) PE61102F, WUAF0SR2303B2, \*Triplet radical pairs, \*Nitroxide radicals, \*Antiscavenging, Phenethyl, Phenethylacyl, Diphenylpentan-3-one, Geminate, Cage effects, TEMPO

PERSONAL AUTHORS: Andrews, Lester

CONTRACT NO. F49620-93-1-0331

PROJECT NO. 2303

TASK NO. ES

MONITOR: AFOSR, XC  
TR-94-0452, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) Research has been done with pulsed-laser evaporated B, Be and Mg atoms and molecular hydrogen to explore the reactivities of these metals with He and to investigate infrared spectra of the product molecules in solid argon. The major products in the B/H2 system were BH, (H2)(BH), BH3, (H2)(BH3) and B2H6. It is clear that molecular hydrogen is complexed to BH and BH3 in these experiments

DESCRIPTORS: (U) \*ATOMS, \*BORON, \*CHEMISTRY, \*MATRIX MATERIALS, \*BERYLLIUM, \*MAGNESIUM, ARGON, HYDROGEN, INFRARED SPECTRA, LASERS, METALS, MOLECULES, PULSED LASERS, REACTIVITIES, SOLIDS, SPECTRA, HELIUM, HYDRIDES, EVAPORATION.

IDENTIFIERS: (U) PE61102F, WUAF0SR2303ES, Product

AD-A282 855

AD-A282 840

UNCLASSIFIED

PAGE 84 . T4035K

## UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A282 827 20/5 7/2 20/6 20/12 AD-A282 827 CONTINUED

EMORY UNIV ATLANTA GA

(U) Laser Spectroscopy of GdO: Ligand Field Assignments of 4f7(8S)6p Reversing 4f7(8S)6s Transitions,

94 13P

\*LASERS, \*SPECTROSCOPY, \*GADOLINIUM, ALLOCATIONS, COUPLINGS, ELECTRONICS, ENERGY, EXCITATION, FIELD THEORY, FLUORESCENCE, INTERACTIONS, INTERVALS, MODELS, MOLECULES, ORBITS, PERTURBATION THEORY, RESOLUTION, STRUCTURES, TRANSITIONS, ELECTRONIC STATES, MOLECULAR PROPERTIES, SPIN STATES, MOLECULAR ORBITALS, LANTHANUM, DIATOMIC MOLECULES, ATOMIC ENERGY LEVELS, IONS, REPRINTS.

PERSONAL AUTHORS: Kaledin, Leonid A.; Erickson, Matthew G.; Heaven, Michael C.

IDENTIFIERS: (U) WUAFOSR2303ES, PE61102F, Lanthanide oxide

PROJECT NO. 2303

TASK NO. ES

MONITOR: AFOSR, XC  
TR-94-0438, AFOSR

## UNCLASSIFIED REPORT

Availability: Pub. in Jnl. of Molecular Spectroscopy v165 p323-333 1994. Available only to DTIC users. No copies furnished by NTIS.

ABSTRACT: (U) Wavelength-resolved fluorescence excitation techniques have been used to record three electronic transitions of GdO at a resolution of 0.03/cm1. Previous analyses of two bands have been extended with some corrections to the assignments of low-J lines. Improved molecular constants were obtained for the X9(sigma)- and a7(sigma)- states that correlate with Gd2+(4f7((8S)6s)02-. A large difference between the spin-orbit coupling constants for X9(Sigma)-(Lambda = -0.10353/cm) and a7(Sigma)-(Lambda = 0.64712/cm) was noted. This difference was ascribed to the fact that the X state is almost pure f7((8S), whereas the a state has partial f7(6p) character. Analysis of the a state required off-diagonal matrix elements of the spin-orbit interaction, evaluated using sixth-order degenerate perturbation theory, for treatment of non-rotating molecule spin-orbit intervals. In principle, these elements are needed to describe Sigma states of septet and higher multiplicity. Energy intervals reflecting the structure Gd2+(4f7((8S)6p)02- were recognized among the excited states of GdO. Overall, the results were consistent with ligand field theory models for the excited states of lanthanide oxide (LnO) molecules

DESCRIPTORS: (U) \*LIGANDS, \*OXIDES, \*RARE EARTH ELEMENTS,

AD-A282 827

AD-A282 827

UNCLASSIFIED

PAGE 85

T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A282 789 7/4 7/2 7/3 20/5

AD-A282 789 CONTINUED

NEW MEXICO UNIV ALBUQUERQUE DEPT OF CHEMISTRY

(U) Hydrolysis and Condensation of Tin (IV) Alkoxide  
Compounds: The Control of Structural Evolution.

DESCRIPTIVE NOTE: Annual rept. Apr 93-Jun 94,

JUN 94 19P

PERSONAL AUTHORS: Hampden-Smith, M. J.

CONTRACT NO. F49620-93-1-0197

PROJECT NO. 2303

TASK NO. BS

MONITOR: AFOSR, XC  
TR-94-0447, AFOSR

UNCLASSIFIED REPORT

**ABSTRACT:** (U) We are investigating the mechanism of ester elimination reactions between metal alkoxide compounds and metal carboxylate compounds as a method to form metal-oxo clusters in a controlled fashion. We anticipate that the fundamental insight gained will result in a better understanding of methods to control the evolution of microstructure in metal oxide ceramics. Two parts of our preliminary experiments are reported here. Part 1 describes a series of proton (<sup>1</sup>H) NMR magnetization transfer experiments utilized to measure the kinetic parameters of alcohol interchange between the homoleptic metal alkoxide, Sn(O-t-Bu)<sub>4</sub>, and t-butanol, its parent alcohol. These data suggest that the metal center, even in sterically encumbered metal alkoxide compounds such as Sn(O-t-Bu)<sub>4</sub>, are sufficiently coordinately and electronically unsaturated to react with bulky alcohols. These observations must be taken into account when conducting sol-gel type hydrolysis and condensation reactions. In part 2, the alkoxide Sn(O-t-Bu)<sub>4</sub> and carboxylate Me<sub>3</sub>Si(OAc) are used in a detailed study of the ester elimination process. We report time dependent 170 NMR spectra of the ester elimination reaction of the two from which a plausible associative transition state can be described. Microstructure, Porosity, Tin oxide.

**DESCRIPTORS:** (U) \*ALCOHOLS, \*BUTANOLS, \*CONDENSATION REACTIONS, \*HYDROLYSIS, \*KINETICS, \*METALS, \*STRUCTURES, \*TIN, CONTROL, ELIMINATION REACTIONS, ESTERS, MAGNETIZATION, MICROSTRUCTURE, OXIDES, POROSITY, PROTONS, SPECTRA, CERAMIC MATERIALS, EVOLUTION(GENERAL), TIME, TRANSFER, TRANSITIONS.

**IDENTIFIERS:** (U) PE61102F, WUAFOSR2303BS, \*Alkoxide, \*Exchange, Carboxylate, Oxo, Homoleptic, Sol gel process.

AD-A282 789

AD-A282 789

UNCLASSIFIED

PAGE

86

T4035K



## UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A282 785 7/2 20/6 9/3 20/5

AD-A282 781 20/6 9/5

ALABAMA A AND M UNIV NORMAL

ARIZONA UNIV TUCSON OPTICAL SCIENCES CENTER

(U) Near-Infrared to Blue Energy Upconversion in LaF(3): Ho3+.

(U) New Mechanisms and New Materials for Organic Optical Nonlinearity.

MAY 94 7P

DESCRIPTIVE NOTE: Annual rept. 2 Jun 93-1 Jun 94,

PERSONAL AUTHORS: Reddy, B. R.; Nash-Stevenson, S.; Venkateswarlu, P.

JUN 94 12P

PERSONAL AUTHORS: Peyghambarian, N.; Mazumdar, S.; Armstrong, N.

CONTRACT NO. AFOSR-90-0160

PROJECT NO. 3484

CONTRACT NO. F49620-93-1-0199

TASK NO. RS

MONITOR: AFOSR, XC

MONITOR: AFOSR, XC  
TR-94-0443, AFOSR

TR-94-0432, AFOSR

UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

Availability: Pub. in Jnl. of Optical Society of America B, v11 n5 p923-927, May 94. Available only to DTIC users. No copies furnished by NTIS.

ABSTRACT: (U) LaF3:Ho3+ is an ideal system to pursue energy-upconversion studies. Energy upconversion in Ho3+ was studied earlier in doubly doped crystals, glasses, fibers, and other crystals. To our knowledge, ours is the first observation in LaF3:Ho3+ and is one of the most efficient systems for energy-upconversion purposes. The crystals used in the study were obtained from Optovac. The Ho3+ concentrations are 0.1%, 0.5% and 1%. An Ar+-pumped cw dye laser, A Ti:sapphire laser and a N2-pumped dye laser were used to excite the materials

DESCRIPTORS: (U) \*LANTHANUM, \*FLUORIDES, \*ENERGY TRANSFER, \*HOLMIUM, \*NEAR INFRARED RADIATION, \*BLUE(COLOR), \*REPRINTS, \*DOPING, \*CRYSTALS, \*GLASS, \*FIBERS, \*ARGON, \*IONS, \*PUMPING, \*CONVERSION, \*OPTICS, \*CONTINUOUS WAVES, \*DYE LASERS, \*TITANIUM, \*SAPPHIRE, \*LASERS, \*EXCITATION, \*RESONANCE, \*RED(COLOR), \*LASER BEAMS, \*GREEN(COLOR), \*EMISSION, \*RELAXATION, \*ABSORPTION, \*PHOTONS.

IDENTIFIERS: (U) \*Energy upconversion, Nonradiative.

ABSTRACT: (U) In order to be photorefractive, a material has to combine photogeneration, photoconductivity, trapping and electro-optic (EO) properties. For our work we have developed a guest/host polymer composite based on the photoconducting polymer poly(N-vinylcarbazole) (PVK). Photosensitivity in the visible was provided by the charge transfer (CT) complex that PVK forms with 2,4,7-trinitro-9-fluorenone (TNF). The azo dye 2,5-dimethyl-4-(p-nitrophenylazo) anisole (DMNPAA) was used as the EO active chromophore. We added N-ethylcarbazole (ECZ) as an additional plasticizer to further decrease the glass transition temperature of the material. This guarantees good alignment of the nonlinear optical chromophores in an externally applied electric fields, necessary to obtain a macroscopic EO effect in the material

DESCRIPTORS: (U) \*NONLINEAR OPTICS, \*OPTICAL MATERIALS, \*ELECTROOPTICS, \*THIN FILMS, \*PHOTOSENSITIVITY, \*POLYMERS, \*ELECTRIC FIELDS, \*CHROMOPHORES, \*CHARGE TRANSFER.

IDENTIFIERS: (U) Photorefraction

AD-A282 785

AD-A282 781

UNCLASSIFIED

PAGE 87

T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A282 767 7/3

AD-A282 767 CONTINUED

IDAHO UNIV MOSCOW

PREPARATION, SILANES, SILOXANES, FLUORINE COMPOUNDS, HETEROCYCLIC COMPOUNDS, SYNTHESIS(CHEMISTRY), OXIDATION, THERMAL STABILITY.

(U) Research on Organofluorine Chemistry for 700 Degrees F Thermooxidative Stability.

DESCRIPTIVE NOTE: Final technical rept.,

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B2.

JUN 94 22P

PERSONAL AUTHORS: Shreeve, Jeanne M.; Kirchmeier, Robert L.

CONTRACT NO. AFOSR-91-0189

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR, XC  
TR-94-0455, AFOSR

UNCLASSIFIED REPORT

**ABSTRACT:** (U) Much exciting chemistry has been completed over the three year course of this grant. The 32-membered fluorinated multifunctional heterocycle (C(O)N(CH<sub>3</sub>)S<sub>02</sub>(CF<sub>2</sub>)<sub>20</sub>(CF<sub>2</sub>)<sub>40</sub>(CF<sub>2</sub>)<sub>2</sub>(S<sub>02</sub>)(CH<sub>3</sub>NC(O))<sub>2</sub> was prepared and a crystal structure was obtained. New, efficient routes for the preparation of fluorinated amines and azaalkenes have been developed, and several members of a nearly unknown class of compounds, i.e., fluoroalkyl(aryl) tetraazanes were prepared and characterized. Methods were also developed for the synthesis of perfluoropropylidene containing aromatic and alkyl ethers. R, transfer reagents, e.g., CF<sub>3</sub>Si(CH<sub>3</sub>)<sub>3</sub> and C<sub>6</sub>F<sub>5</sub>Si(CH<sub>3</sub>)<sub>3</sub> as well as R(sub f)OSi(CH<sub>3</sub>)<sub>3</sub> were prepared and applied to the preparation of novel ethers, and substituted aromatic compounds. Several fluorinated macroheterocycles were synthesized using multifunctional silanes and siloxanes. The chemistry of perfluorovinylamines has been explored in some detail. Multifunctional macroheterocycles, Fluoroalky polynitrogen compounds, Fluoroazaalkenes, Perhaloalkanesulfinyl chloride, Perhaloalkanesulfinate esters, Fluorinated tetraazanes, Hexafluorobenzene derivatives, Fluorinated silanes.

**DESCRIPTORS:** (U) \*AMINES, \*ALKENES, AROMATIC COMPOUNDS, CHLORIDES, CRYSTAL STRUCTURE, ETHERS, HEXAFLUOROBENZENE,

AD-A282 767

AD-A282 767

UNCLASSIFIED

PAGE

88

T4035K

## UNCLASSIFIED

## DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A282 735 9/3 7/2 20/5

AD-A282 726 7/2 20/5

EMORY UNIV ATLANTA GA DEPT OF CHEMISTRY

UNIVERSITY OF SOUTHERN CALIFORNIA DOWNEY

(U) The Role of Excited Molecular Iodine in the Chemical Oxygen Iodine Laser,

(U) Gas-Surface Interactions Near Dissociation Threshold.

JUN 94 8P

JUN 94 6P

PERSONAL AUTHORS: Heaven, Michael C.; Nowlin, Melvin L.

PERSONAL AUTHORS: Reister, Hanna; Wittig, Curt

CONTRACT NO. F49620-92-J-0073

CONTRACT NO. F49620-92-J-0168

PROJECT NO. 2303

PROJECT NO. 2303

TASK NO. ES

TASK NO. ES

MONITOR: AFOSR, XC  
TR-94-0435, AFOSRMONITOR: AFOSR, XC  
TR-94-0458, AFOSR

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

Availability: Pub. in AIAA Plasmadynamics and Lasers Conference (25th), 20-23 Jun 94. Available only to DTIC users. No copies furnished by NTIS.

ABSTRACT: (U) The relaxation dynamics of vibrationally excited levels of I<sub>2</sub>(X) are of relevance to the chemical oxygen iodine laser. We have investigated relaxation of I<sub>2</sub>(v > 20) by pulsed laser techniques. Individual rovibrational levels were populated by stimulated emission pumping. Collisionally populated levels were monitored via laser excitation of the D-X transition. Rate constants for rotational and vibrational relaxation of I<sub>2</sub>(v > 20) by He, Ar, I<sub>2</sub>, O<sub>2</sub> and H<sub>2</sub>O are reported. Improved spectroscopic constants for the I<sub>2</sub> D state are also presented.

DESCRIPTORS: (U) \*EXCITATION, \*IODINE, \*CHEMICAL LASERS, \*MOLECULAR PROPERTIES, \*CHEMICALS, \*CONSTANTS, \*DYNAMICS, \*EMISSION, \*LASERS, \*OXYGEN, \*PULSED LASERS, \*PUMPING, \*RATES, \*RELAXATION, \*TRANSITIONS, \*REPRINTS, \*VIBRATION, \*ROTATION, \*COLLISIONS, \*HELIUM, \*ARGON.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303ES.

AD-A282 735

AD-A282 726

## UNCLASSIFIED

PAGE 89

T4035K

DESCRIPTORS: (U) \*CHLORIDES, \*DISSOCIATION, \*NITROGEN

Adsorption, Photodesorption

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A282 726 CONTINUED

AD-A282 649 9/3 9/5

OXIDES, \*GAS SURFACE INTERACTIONS, ADSORBATES, ADSORPTION, ATOMS, CLUSTERING, COLLISIONS, DEPOSITION, IONIZATION, NUCLEATION, OXYGEN, PHOTODISSOCIATION, RESOLUTION, TEMPERATURE, MOLECULAR ROTATION, MASS SPECTROMETRY, INFRARED SPECTROSCOPY, MAGNESIUM OXIDES, MOLECULE MOLECULE INTERACTIONS, EXPERIMENTAL DATA.

MARYLAND UNIV COLLEGE PARK DEPT OF ELECTRICAL ENGINEERING

(U) Wavelength-Encoded Processing in Semiconductor Lasers.  
DESCRIPTIVE NOTE: Final rept.,

IDENTIFIERS: (U) WUAFOSR2303ES, PE61102F.

JUN 94 142P

PERSONAL AUTHORS: Dagenais, M.

CONTRACT NO. AFOSR-91-0132

PROJECT NO. 1601

TASK NO. 10

MONITOR: AFOSR, XC  
TR-94-0457, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) It was the goal of this proposal to study the process of wavelength conversion and wavelength encoded processing in semiconductor laser types of devices. In particular, we report on (1) the implementation of Boolean logic using wavelength encoded inputs, (2) the use of frequency modulation to control the transmission of a Fabry-Perot laser, (3) nonlinear spectral filtering of a multi-wavelength signal, (4) wavelength-conversion and logic operation based on bistable diode laser amplifiers, including a study of crosstalk, switching power, bit-error-rates, and demonstration of an optically controllable space-switch, (5) wavelength-conversion by a T-gate device, (6) wavelength conversion using four-wave mixing in a Fabry-Perot edge-emitting and vertical cavity surface emitting laser, and (7) high-speed polarization switching in vertical-cavity lasers

DESCRIPTORS: (U) \*LASER AMPLIFIERS, \*SEMICONDUCTOR LASERS, \*OPTICAL WAVEGUIDES, \*OPTICAL SWITCHING, AMPLIFIERS, CAVITIES, CONTROL, CONVERSION, CROSSTALK, DEMONSTRATIONS, DIODES, EDGES, ERRORS, FILTRATION, FOUR WAVE MIXING, FREQUENCY, FREQUENCY MODULATION, INPUT, LASERS, LOGIC, MIXING, MODULATION, OPERATION, POLARIZATION, POWER, PROCESSING, RATES, SEMICONDUCTORS, SIGNALS, SURFACES, SWITCHES, SWITCHING, VELOCITY, BOOLEAN

AD-A282 726

AD-A282 649

UNCLASSIFIED

PAGE 90

T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A282 649 CONTINUED

AD-A282 626 20/6 20/12

ALGEBRA, SEMICONDUCTOR DIODES, LASER CAVITIES,  
FABRICATION, PHOTONICS, COMPUTERS, MULTIPLEXING.

CALIFORNIA UNIV SANTA BARBARA DEPT OF ELECTRICAL AND  
COMPUTER ENGINEERING

IDENTIFIERS: (U) PE63218C, WUAFOSR160110

(U) Studies of Optical Phase Conjugators and Applications.

DESCRIPTIVE NOTE: Final rept. 1 Jul 91-30 Sep 93,

SEP 93 88P

PERSONAL AUTHORS: Yeh, Pochi

CONTRACT NO. AFOSR-91-0299

PROJECT NO. 2301

TASK NO. AS

MONITOR: AFOSR, XC  
TR-94-0419, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The main objective of this research is to theoretically investigate the physics of various optical phase conjugation processes (e.g., four-wave mixing, stimulated Brillouin scattering, photorefractive self- or mutually pumped phase conjugators) in nonlinear optical media (photorefractive crystals, optical fibers, etc.), and to explore theoretically and/or experimentally various kinks of applications of optical phase conjugation and nonlinear optical processes

DESCRIPTORS: (U) \*OPTICAL ANALYSIS, \*NONLINEAR OPTICS, CRYSTALS, MEDIA, FIBER OPTICS, PHASE DISTORTION, FOUR WAVE MIXING, BRILLOUIN ZONES, REFRACTIVE INDEX, KERR MAGNETOOPTICAL EFFECT, BRAGG SCATTERING, REFLECTANCE, ELECTRON BEAMS, CHARGE CARRIERS, ENERGY TRANSFER, FABRY PEROT INTERFEROMETERS.

IDENTIFIERS: (U) Optical phase conjugation,  
Photorefractive effect, PE61102S, WUAFOSR230AS

AD-A282 649

AD-A282 626

UNCLASSIFIED

PAGE 91

T4035K

## UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A282 618 7/5 7/4 7/3 11/7

AD-A282 615 7/2 11/4

COLUMBIA UNIV NEW YORK DEPT OF CHEMISTRY

CALIFORNIA UNIV SANTA BARBARA DEPT OF CHEMISTRY

(U) ASSERT-92: A Novel Photochemical and Interfacial Approach to the Degradation of Hazardous Materials.

(U) Cluster Ions.

DESCRIPTIVE NOTE: Annual rept. 1 Jun 93-31 May 94, JUN 94 5P

DESCRIPTIVE NOTE: Annual rept. 15 Feb 93-14 Feb 94, JUN 94 4P

JUN 94 5P

JUN 94 4P

PERSONAL AUTHORS: Turro, Nicholas J.

PERSONAL AUTHORS: Bowers, Michael T.

CONTRACT NO. F49620-93-1-0292

REPORT NO. F49620-93-1-0134

PROJECT NO. 3484

PROJECT NO. 2303

TASK NO. XS

TASK NO. ES

MONITOR: AFOSR, XC

MONITOR: AFOSR, XC  
TR-94-0454, AFOSR

TR-94-0454, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) An intriguing proposal is that the intramolecular hydrogen bond of 3Bz 'locks' the species into a conformation unfavorable to reaction. We have begun to study this reaction with many of the techniques used previously to study 3BP and 3DBK. Recently, theorists have studied the use of coherent laser excitation to select pathways for chemical reactions -- to use light to shape the wavefunctions of the molecules' excited states. With this work, we advance a more mundane, but, perhaps, also a more practical method to shape these wavefunctions and thereby control chemical reaction pathways. We have shown that by controlling the conformation of a molecule one may sometimes control the shape of the excited state as well

DESCRIPTORS: (U) \*CHEMICAL REACTIONS, \*PHOTOCHEMICAL REACTIONS, \*INTERFACES, \*DEGRADATION, \*HAZARDOUS MATERIALS, \*BENZOPHENONES, EXCITATION, HYDROGEN BONDS, LASERS, LIGHT, SHAPE, KETONES, COHERENCE, BENZYL RADICALS, WAVE FUNCTIONS, MOLECULES, CONTROL.

IDENTIFIERS: (U) WUAFOSR3484XS, AASERT-92, \*Pathways, BP(Benzophenone), DBK(Dibenzyl Ketone), Triplet

AD-A282 618

AD-A282 615

UNCLASSIFIED

PAGE

\$2

T4035K

ABSTRACT: (U) The objective of this grant is the generation and characterization of clusters of new materials of possible technological importance. Our work is currently focused on carbon based clusters and on metal/carbon composite clusters. The metals currently being investigated belong to the first and second row transition series. Progress has been made on both cluster types. Clusters, Ions

DESCRIPTORS: (U) \*CARBON, \*FULLERENES, \*METAL MATRIX COMPOSITES, IONS, TRANSITIONS, CLUSTERING, IRON, TITANIUM, ISOMERS, CHROMATOGRAPHY.

IDENTIFIERS: (U) WUAFOSR2303ES, Ion chromatography

## UNCLASSIFIED

## DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. T4035K

AD-A282 599

6/5

6/4

9/3

AD-A282 598

7/2

20/5

12/5

MASSACHUSETTS GENERAL HOSPITAL BOSTON WELLMAN LABS OF  
PHOTOMEDICINE

COLORADO UNIV AT BOULDER

(U) Reactions of Atmospheric Cluster Ions.

(U) Ultrashort Laser Pulse Effects in Ocular and Related  
Media: Laser-Induced Shock Wave Propagation and  
Retinal Damage.

DESCRIPTIVE NOTE: Annual technical rept. 1 Jun 93-31 May  
94,

DESCRIPTIVE NOTE: Annual technical rept. 15 Apr 93-14 Apr  
94,

JUN 94 2P

PERSONAL AUTHORS: Leone, Stephen R.; Bierbaum, Veronica M.

JUN 94 8P

PERSONAL AUTHORS: Deutsch, T. F.; Doukas, A. G.; Flotte,  
T.; Dorey, K.; Lee, S.

CONTRACT NO. F49620-93-1-0372

PROJECT NO. 3484

CONTRACT NO. F49620-93-1-0290

PROJECT NO. 2312

TASK NO. AS

MONITOR: AFOSR, XC

TR-94-0459, AFOSR

UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

ABSTRACT: (U) The goals of this project are: (1) To develop assays for functional damage to retinal cells by pressure waves (stress transients); (2) To determine the acoustic properties of the aqueous and vitreous humors of the eye; and (3) To examine the effect of pressure waves to the retinal pigment epithelium in vitro. During this first year our efforts have been directed primarily at the first goal, with some initial efforts on the second. During this period we developed the capability of growing human retinal pigment epithelium (RPE) cells in culture, incorporating them into capillaries, recovering them after exposure to stress transients and assessing cell damage

DESCRIPTORS: (U) \*LASER MEDICAL DIAGNOSIS, \*RETINA, ACOUSTIC PROPERTIES, ACOUSTICS, CELLS, CULTURE, DAMAGE, EPI-THELIUM, EYE, HUMANS, PIGMENTS, PRESSURE, TRANSIENTS, SHOCK WAVES, DAMAGE ASSESSMENT.

IDENTIFIERS: (U) PE61102F, WUAFOSR2312AS, \*Ultrashort laser pulses

AD-A282 599

AD-A282 598

UNCLASSIFIED

PAGE 93

T4035K

ABSTRACT: (U) In our first year of AASERT support, we have developed the necessary instrumentation and computer programs for measuring the mobilities of cluster ions using ion modulation/arrival time techniques. As a test of the methodology, we have carried out a systematic study of the mobility of CO<sup>+</sup> in helium buffer gas as a function of drift field and have found excellent agreement with previous results. Studies of the mobilities and reactions of atmospheric cluster ions using our SIFT instrument are being initiated. Ion-Molecule reactions, Atmospheric ions, Mobilities, Cluster ions, Selected ion flow tube

DESCRIPTORS: (U) \*ATMOSPHERICS, \*IONS, \*REACTIVITIES, \*CLUSTERING, \*CARBON MONOXIDE, ARRIVAL, BUFFERS, COMPUTER PROGRAMS, DRIFT, FLOW, FUNCTIONS, HELIUM, INSTRUMENTATION, METHODOLOGY, MOBILITY, MODULATION, MOLECULES, TEST AND EVALUATION, TIME, TUBES, ION MOLECULE INTERACTIONS, GASES, MASS SPECTROMETRY.

IDENTIFIERS: (U) PE61103D, WUAFOSR3484XS, SIFT (Selected Ion Flow Tube), Drift field, Chemical physics, \*Cluster ions



UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A282 597 9/1 20/6 20/3 20/10 AD-A282 597 CONTINUED

EMORY UNIV ATLANTA GA

(U) Magneto-Optical Properties of Quantum Structures with Reduced Dimensionality. PERTURBATIONS, WIRE, ELECTRIC FIELDS, OPTICAL PROPERTIES. IDENTIFIERS: (U) PE61102F, WUAFOSR2305ES, Quantum wire.

DESCRIPTIVE NOTE: Final technical rept. 1 Dec 90-31 Mar 94,

MAR 94 80P

PERSONAL AUTHORS: Bajaj, Krishan K.

CONTRACT NO. AFOSR-91-0056

PROJECT NO. 2305

TASK NO. ES

MONITOR: AFOSR, XC  
TR-94-0434, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) We have reported the results of the calculations of the exciton binding energies and oscillator strengths in type II quantum well structures both in the absence and in the presence of a magnetic field using a variety of variational and perturbation approaches. We have reported the results of the calculations of the energy levels of excitons and hydrogenic impurities in coupled double quantum well structures in the presence of a magnetic field. We have also described the results of our calculations of the energy levels of excitons and hydrogenic donors in quantum well wires in the presence of a magnetic field. We have also described the results of our calculation of the binding energies of hydrogenic donors in quantum dots in the presence of magnetic field. We have reported the results of our calculations of the energy level of hydrogenic impurities and excitons in dielectric quantum wells in the presence of electric and magnetic fields. And finally, we have presented results of our calculations of the exciton binding energies in ionic quantum well structures.

DESCRIPTORS: (U) \*EXCITONS, \*QUANTUM WELLS, \*MAGNETOOPTICS, \*SEMICONDUCTORS, DIELECTRICS, ENERGY LEVELS, IMPURITIES, MAGNETIC FIELDS, OSCILLATORS,

AD-A282 597

AD-A282 597

UNCLASSIFIED

PAGE

94

T4035K

## UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A282 563 CONTINUED

EMORY UNIV ATLANTA GA SCHOOL OF DENTISTRY

ROTATION, IRRADIATION, PHYSICAL CHEMISTRY, INORGANIC CHEMISTRY.

(U) Spectroscopy of Metastable Species in a Free-Jet  
Expansion: The D' to A' (Reverse) Transition of IBr.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2302ES, Species, \*Free-jet expansion, Inert gas.

94 18P

PERSONAL AUTHORS: Zheng, Xiaonan; Heaven, Michael C.;  
Tellinghuisen, Joel

CONTRACT NO. F49620-92-J-0073

PROJECT NO. 2303

TASK NO. ES

MONITOR: AFOSR, XC  
TR-94-0437, AFOSR

## UNCLASSIFIED REPORT

Availability: Pub. in Jnl. of Molecular Spectroscopy, v164 p135-151 1994. Available to DTIC users only. No copies furnished by NTIS.

ABSTRACT: (U) All of the diatomic halogens exhibit strong charge-transfer-type electronic transitions between the valence states, which correlate atomically with two ground term (2P) atoms, and the higher-lying ion-pair states, which tend toward X-(1S)+X+(Y+)(3P, 1D, 1S). Many transitions of this type occur readily in emission from discharges containing the halogen in an inert buffer gas such as Ar, He, or N<sub>2</sub>. Although these spectra have been known since the early decades of this century, their understanding has been mostly qualitative until fairly recently. Beginning about 20 years ago, interest in these transitions as potential active media in new electronic transition lasers sparked renewed study of the spectra, leading to what is now a fairly comprehensive understanding of these systems in many of the halogens and detailed spectroscopic descriptions of many of the electronic states involved

DESCRIPTORS: (U) \*IODINE, \*BROMIDES, \*HALOGENS, \*METASTABLE STATE, \*SPECTROSCOPY, \*DIATOMIC MOLECULES, REPRINTS, TRANSITIONS, CHARGE TRANSFER, ELECTRONIC STATES, VALENCE, ATOMS, IONS, EMISSION, BUFFERS(CHEMISTRY), GASES, ARGON, HELIUM, NITROGEN, LASERS, PHOTOLYSIS, EXCITATION,

AD-A282 563

AD-A282 563

UNCLASSIFIED

PAGE 95

T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A282 562 CONTINUED

AD-A282 562 21/2 9/3 20/6

PENNSYLVANIA STATE UNIV UNIVERSITY PARK DEPT OF  
MECHANICAL ENGINEERING

(U) Spatially Resolved Measurements of Soot Volume  
Fraction Using Laser-Induced Incandescence.

94 11P

PERSONAL AUTHORS: Quay, B.; Lee, T.-W.; Ni, T.; Santoro,  
R. J.

CONTRACT NO. F49620-92-J-0161

PROJECT NO. 2308

TASK NO. BS

MONITOR: AFOSR, XC  
TR-94-0462, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Combustion and Flame, v97 p384-392  
1994. Available only to DTIC users. No copies furnished  
by NTIS.

ABSTRACT: (U) Laser-induced incandescence is used to  
obtain spatially resolved measurements of soot volume  
fraction in a laminar diffusion flame, in which  
comparisons with laser scattering/extinction data yield  
excellent agreement. In addition, the laser-induced  
incandescence signal is observed to involve a rapid rise  
in intensity followed by a relatively long (ca. 600 ns)  
decay period subsequent to the laser pulse, while the  
effect of laser fluence is manifest in nonlinear and near-  
saturated response of the laser-induced incandescence  
signal with the transition occurring at a laser fluence of  
approximately  $1.2 \times 10^8$  (exp 8 w/sq cm). Spectral response  
of the laser-induced incandescence involves a continuous  
spectrum in the visible wavelength range due to the  
blackbody nature of the emission. Simultaneous  
measurements of laser-induced incandescence and light  
scattering yield encouraging results concerning the mean  
soot particle diameter and number concentration. The  
laser-induced incandescence can be used as an  
instantaneous, spatially resolved diagnostic of soot  
volume fraction without the need for the conventional  
line-of-sight laser extinction method, while potential

AD-A282 562

AD-A282 562

UNCLASSIFIED

PAGE 96 T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. T4035K

AD-A282 548

20/6

AD-A282 547 6/4 12/5

AIR TRAINING COMMAND RANDOLPH AFB TX DCS/TECHNICAL TRAINING

JOHNS HOPKINS UNIV BALTIMORE MD SCHOOL OF MEDICINE

(U) Light Beam and Pulse Propagation in Nonlinear Dielectrics.

(U) Visual Psychophysics of Egomotion.

DESCRIPTIVE NOTE: Final rept.,

DESCRIPTIVE NOTE: Final rept. 1 Oct 90-30 Sep 93,

JUN 94 10P

SEP 93 6P

PERSONAL AUTHORS: Turano, Kathleen

PERSONAL AUTHORS: Aceves, Alejandro

CONTRACT NO. AFOSR-91-0154

CONTRACT NO. AFOSR-91-0009

PROJECT NO. 2313

PROJECT NO. 2304

TASK NO. CS

TASK NO. A4

MONITOR: AFOSR, XC  
TR-94-0450, AFOSR

MONITOR: AFOSR, XC  
TR-94-0465, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) Currently, one of the major achievements in this project has been in (a) a proposal to use arrays as a way to amplify and shorten pulses, by means of collapse-type mechanisms; in (b) the characterization of three distinct types of nonlinear modes, where that corresponding to the most localized in energy distribution along the array, shows very stable features, including an absence of mode-mode interaction, which make them excellent candidate of information carriers. Some of these results are to appear in two Optics Letters publications.

DESCRIPTORS: (U) \*ELECTROMAGNETIC WAVE PROPAGATION, \*LIGHT PULSES, ARRAYS, COLLAPSE, ENERGY, INTERACTIONS, OPTICAL WAVEGUIDES, DIELECTRICS, NONLINEAR OPTICS.

IDENTIFIERS: (U) WUAFOSR2304A4.

ABSTRACT: (U) Human observers' ability to perceive self motion using information contained within optic-flow patterns was investigated. Subjects discriminated changes in heading direction as stimulus parameters were manipulated. Some of the results were surprising and difficult to explain in the context of current theories. In order to better understand the results, the role of eye movements in self-motion detection and in speed discrimination was investigated. The end product is a model that can account for the findings. The optimal stimulus for motion detection was also explored to define the shape (x,y,t) of the human motion sensors, which are believed to be involved in the early processing stages of self-motion perception. A computational model for the extraction of 3D motion information from 2D motion information was also developed. The neural network model was able to qualitatively account for the human observer's ability to detect changes in heading direction. Egomotion, Motion perception, Curvilinear motion, Self motion perception, Eccentricity, Eye movements.

DESCRIPTORS: (U) \*EYE MOVEMENTS, \*MOTION, \*VISUAL PERCEPTION, DISCRIMINATION, ECCENTRICITY, EXTRACTION, OPTICAL DETECTION, HUMAN FACTORS ENGINEERING, IMAGE MOTION COMPENSATION, NEURAL NETS, PARAMETERS, PATTERNS, THREE DIMENSIONAL, COMPUTERIZED SIMULATION, PROCESSING, SHAPE, VELOCITY, PSYCHOPHYSICS.

AD-A282 548

AD-A282 547

UNCLASSIFIED

PAGE 97

T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A282 547 CONTINUED

AD-A282 546 7/2 9/3 20/5 20/13

EMORY UNIV ATLANTA GA

IDENTIFIERS: (U) PE61102F, Egomotion.

(U) Laser Spectroscopy of UO: Characterization and Assignment of States in the 0- to 3-eV Range, with a Comparison to the Electronic Structure of ThO.

94 41P

PERSONAL AUTHORS: Kaledin, Leonid A.; McCord, John E.; Heaven, Michael C.

CONTRACT NO. F49620-92-J-0073

PROJECT NO. 2303

TASK NO. ES

MONITOR: AFOSR, XC  
TR-94-0436, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. Jnl. of Molecular Spectroscopy, v164 p27-65 1994. Available only to DTIC users. No copies furnished by NTIS.

ABSTRACT: (U) The development of global electronic structure models for elementary actinide compounds is of practical as well as fundamental interest. For example, knowledge of rovibronic energy levels is required for calculations of thermodynamic properties by means of statistical mechanics. Such data is difficult to obtain for many actinide compounds as they are short-lived and/or hazardous to work with. Hence, models that can reliably predict rovibronic energies, and subsequently the thermodynamic properties, are highly desirable (Author)

DESCRIPTORS: (U) \*LASERS, \*URANIUM COMPOUNDS, \*ACTINIDE SERIES COMPOUNDS, \*OXIDES, \*ELECTRONIC STATES, \*THORIUM, \*SPECTROSCOPY, REPRINTS, HEAVY ELEMENT COMPOUNDS, MOLECULAR STRUCTURE, FLUORESCENCE, EXCITATION, ROTATION, GROUND STATE, LIGANDS, LOW ENERGY, IONIZATION, ENERGY LEVELS, THERMODYNAMICS, MODELS, INORGANIC COMPOUNDS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303ES, Wavelength-revolved, Relativistic, Dirac-Fock formalism, Rovibronic, LFT(Ligand Field Theory)

AD-A282 547

AD-A282 546

UNCLASSIFIED

PAGE 98 T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A282 452 AD-A282 452 CONTINUED

MICHIGAN STATE UNIV EAST LANSING DEPT OF PEDIATRICS/  
HUMAN DEVELOPMENT

(U) The Role of Chemical Inhibition of Gap Junctional  
Intercellular Communication in Toxicology.

DESCRIPTIVE NOTE: Annual technical rept. 14 May 93-15 May  
94,

JUN 94 206P

PERSONAL AUTHORS: Trosko, James E.

CONTRACT NO. F49620-92-J-0293

PROJECT NO. 2312

TASK NO. AS

MONITOR: AFOSR, XC  
TR-94-0421, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) Gap Junctional Intercellular Communication (GJIC) is the biological process which regulates homeostatic control of cell proliferation, differentiation and adaptive functions of differentiated cells. Disruption of GJIC by toxic chemicals, either at the level of gene expression or protein function, has been correlated with teratogenesis, tumor promotion, reproductive and neurotoxicities. The mechanisms by which various epigenetic toxicants or oncogenes inhibit GJIC have been studied in this project. Modulation of phosphorylation of one gap junction protein (cx43) by two different tumor promoters (phorbol esters, DDT) has been shown to be different, yet the end result (inhibition of GJIC) is the common end point. Preliminary evidence has linked the toxic-chemical modification of the gap junction protein phosphorylation paths with altered trafficking of the protein within the cell. Further studies will extend these studies to build a solid mechanistic base for a biological risk assessment model for epigenetic or non-genotoxic chemicals.

DESCRIPTORS: (U) \*GENES, \*NEOPLASMS, \*CELL DIVISION, \*TOXICITY, CHEMICALS, CONTROL, DDT, ESTERS, INHIBITION, PHOSPHORYLATION, RISK, PROTEIN METABOLISM, TERATOGENIC

AD-A282 452

UNCLASSIFIED

AD-A282 452

PAGE 99

T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A282 451 CONTINUED

CALIFORNIA UNIV IRVINE DEPT OF CHEMISTRY

(U) Advanced Cryogenic Propellants.

DESCRIPTIVE NOTE: Annual research rept. 15 Apr 93-14 Apr 94,

APR 94 25P

PERSONAL AUTHORS: Apkarian, V. A.; Gerber, R. B.; Janda, K. C.; Rutledge, J.; Taborek, P.

CONTRACT NO. F49620-93-1-0251

PROJECT NO. 3484

TASK NO. CS

MONITOR: AFOSR, XC  
TR-94-0430, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) Molecular photodynamics in cryogenic solids are pursued in an effort to character the many-body interactions and dynamics that will control the possibilities of preparing, stabilizing, and subsequently using doped solid H<sub>2</sub> as a propellant. While many of the experiments carried out involve inert rare gases, the photophysics sought in these experiments and theoretical developments form the fundamentals that transcend the specific host. In this class of issues are: (a) how to describe the interactions of open shell atoms, which by definition will be the nature of dopants in propellants; (b) development of a basic understanding for the relation between pair potentials and free energy, which controls diffusion kinetics of dopants in compressible solids; (c) to develop time resolved experimental tools to interrogate these in detail; (d) finally, we have carried out studies in one of the candidate systems, namely O doped solid D<sub>2</sub>. Aspects of this work have already been published. A list of the 1993-1994 publications from our group is included, all of this work has resulted either from the URI or the earlier funded AF contract on HEDM from the Phillips Laboratory.

DESCRIPTORS: (U) \*PROPELLANTS, \*RARE GASES, \*SOLIDS, \*MOLECULAR PROPERTIES, \*HYDROGEN, \*CRYOGENIC PROPELLANTS,

AD-A282 451

AD-A282 451

UNCLASSIFIED

PAGE 100 T4035K

ATOMS, CONTROL, DIFFUSION, DYNAMICS, FREE ENERGY, INTERACTIONS, KINETICS, TIME, DOPING, INERT MATERIALS, PHYSICS, COMPRESSIBLE FLOW, EXCITATION, ELECTRONICS, SPECTROSCOPY, SOLID STATE PHYSICS, OXYGEN, N BODY PROBLEM, ROCKET PROPELLANTS.

IDENTIFIERS: (U) PE61103D, WUAFOSR3484CS, \*Photodynamics, Many bodies, Photophysics, Open shell, Pair potentials, Chemical physics



UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A282 450

6/4

AD-A282 450 CONTINUED

HAHNEMANN UNIV PHILADELPHIA PA DEPT OF MENTAL HEALTH SCIENCES

(U) Locus Coeruleus, Vigilance and Stress: Brain Mechanisms of Adaptive Behavioral Responsiveness.

\*STRESS(PHYSIOLOGY), ACCURACY, BRAIN, COGNITION, DECISION MAKING, ELECTRODES, LOCUS, MICROMETERS, MONKEYS, PENETRATION, RECREATION, STIMULI, LEARNING, BEHAVIOR, NEUROBIOLOGY, RESPONSE(BIOLOGY), PSYCHOPHYSICS, QUANTITATIVE ANALYSIS.

DESCRIPTIVE NOTE: Annual technical rept. 31 Feb 92-30 Dec 93,

IDENTIFIERS: (U) PE61102F, WUAFOSR2312BS, LC(Locus Coeruleus)

JUL 94 9P

PERSONAL AUTHORS: Aston-Jones, Gary

CONTRACT NO. F49620-93-1-0099

PROJECT NO. 2312

TASK NO. BS

MONITOR: AFOSR, XC  
TR-94-0471, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) We have recorded electrical activity from more than 200 neurons in the locus coeruleus (LC) in 2 behaving monkeys during the last year. We have made significant technical advances (e.g., use of 10 micrometers-diameter microwires for recordings, increased accuracy of electrode penetrations) which have increased the quality and quantity of data obtained. Results confirm our preliminary findings of the last period, i.e., LC neurons vary activity physically and tonically during a vigilance task indicating a role for the LC system in regulating attentional lability and adaptive responsiveness to urgent stimuli. Moreover, extensive analysis of reversal performance reveals that LC neurons may have a close relationship with cognitive processes underlying stimulus analysis and decision-making. Finally, this analysis also reveals that LC neurons alter their responsiveness to stimuli after reversal of cue meaning in advance of corresponding alterations in behavioral responsiveness, indicating that LC neurons may play an important role in early learning processes, helping to 'entrain' other brain systems to respond adaptively to new significant stimuli.

DESCRIPTORS: (U) \*NERVE CELLS, \*VIGILANCE, \*NEURAL NETS,

AD-A282 450

AD-A282 450

UNCLASSIFIED

PAGE 101

T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A282 449 12/1 11/6.1

AD-A282 448 12/4 12/1

CARNEGIE-MELLON UNIV PITTSBURGH PA

CLEMSON UNIV SC

(U) Computational Methods for Microstructure Covolume  
Techniques of Discretization.

(U) Polyhedral Approaches for Solving 0-1 Polynomial  
Programming Problems.

DESCRIPTIVE NOTE: Final technical rept. 1 Jan 92-31 Mar  
94,

DESCRIPTIVE NOTE: Final rept. 1 Mar 90-30 Nov 93,

MAY 94 5P

JUN 94 12P

PERSONAL AUTHORS: Nicolaides, Roy A.

PERSONAL AUTHORS: Adams, W. P.

CONTRACT NO. F49620-92-J-0133

CONTRACT NO. AFOSR-90-0191

MONITOR: AFOSR, XC  
TR-94-0428, AFOSR

TASK NO. DS

UNCLASSIFIED REPORT

MONITOR: AFOSR, XC  
TR-94-0423, AFOSR

ABSTRACT: (U) This work covers one of the basic  
computational issues in materials science, which is that  
of devising algorithms for computing microstructure.  
Finite element discretizations are used to approximate a  
standard energy density functional. Grid effects are  
found to affect the solutions in some cases and suitable  
remedies are investigated. Covolume methods are a second  
topic of research. Three dimensional error estimates are  
obtained. A new and optimal Voronoi-Delaunay mesh  
generator is given. Microstructure computations, covolume  
methods, Voronoi-Delaunay meshes.

UNCLASSIFIED REPORT

ABSTRACT: (U) New algorithms for the solution of  
quadratic assignment problems and of bilinear programming  
problems have been devised. Empirical evaluation of these  
algorithms against other published results have been  
conducted.

DESCRIPTORS: (U) \*COMPUTATIONS, \*MICROSTRUCTURE, \*FINITE  
ELEMENT ANALYSIS, ALGORITHMS, DENSITY, ENERGY, ERRORS,  
ESTIMATES, GENERATORS, GRIDS, MATERIALS, MESH, STANDARDS,  
THREE DIMENSIONAL, WORK.

DESCRIPTORS: (U) \*ALGORITHMS, \*POLYNOMIALS,  
\*MATHEMATICAL PROGRAMMING, ALLOCATIONS, COMPUTER  
PROGRAMMING, PROBLEM SOLVING.

IDENTIFIERS: (U) Voronoi Delaunay mesh.

IDENTIFIERS: (U) WUAFOSR2304DS, \*Polyhedrals

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A282 333 12/9 20/11

AD-A282 217 20/4 20/11 12/1

MASSACHUSETTS INST OF TECH CAMBRIDGE

STANFORD UNIV CA DEPT OF MATHEMATICS

(U) Shaped Strain Sensors for Intelligent Structures.

(U) Mathematical Problems of Nonlinear Wave Propagation and of Waves in Heterogeneous Media.

DESCRIPTIVE NOTE: Final rept. 1 Nov 91-31 Jan 94,

DESCRIPTIVE NOTE: Final rept. 1 Nov 90-31 Oct 93,

JUN 94 113P

OCT 93 5P

PERSONAL AUTHORS: Anderson, Mark S.; Crawley, Edward

PERSONAL AUTHORS: Keller, Joseph

CONTRACT NO. F49620-92-J-0010

CONTRACT NO. AFOSR-91-0061

MONITOR: AFOSR, XC  
TR-94-0456, AFOSR

MONITOR: AFOSR, XC  
TR-94-0328, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) The design of sensors for use in the control of intelligent structures is investigated. It is found that certain spatially averaging strain sensors can be used to satisfy these requirements. The output and transfer function characteristics of spatially averaging sensors with arbitrary weightings are derived for both sinusoidal and exponential strain fields. An interpretation of shaped sensor behavior is given which explains how the rolloff of shaped sensors can occur for a simulated pinned-pinned beam with collocated Barnett and point sensors. Experiments using clamped-free beams are conducted to verify the predicted rolloff rate of the sensor transfer function. Result of the tests indicates that the sensor's rolloff can be predicted if the sensors (in the experiment) can be implemented properly. In order to investigate the possibility of using an array of spatially averaging sensors to estimate global structural shape, the dynamic mode shapes of pinned-pinned and clamped-free beams are also estimated using a variety of sensor weightings and integration rules. Intelligent structures, Shaped strain sensors.

DESCRIPTORS: (U) \*ARTIFICIAL INTELLIGENCE, \*STRAIN GAGES, \*STRAIN(MECHANICS), ARRAYS, GLOBAL, SHAPE, TEST AND EVALUATION, TRANSFER FUNCTIONS, DETECTORS, DEFLECTION, ACTUATORS, PIEZOELECTRIC MATERIALS, BEAMS(STRUCTURAL).

IDENTIFIERS: (U) Smart structures, Shape memory alloys.

AD-A282 333

AD-A282 217

UNCLASSIFIED

PAGE 103

T4035K

DESCRIPTORS: (U) \*ELASTIC WAVES, \*SHOCK WAVES, \*WAVE PROPAGATION, COMPUTATIONAL FLUID DYNAMICS, SURFACE TENSION, WAVE EQUATIONS, FINITE ELEMENT ANALYSIS, NONLINEAR SYSTEMS, BOUNDARY VALUE PROBLEMS, PERTURBATIONS.

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. T4035K

AD-A281 448 5/9

AD-A281 370 11/4 7/3 7/2 7/6

UNIVERSITY OF CENTRAL FLORIDA ORLANDO

UNIVERSITY OF SOUTHERN MISSISSIPPI HATTIESBURG

(U) Situational Awareness in Complex Systems.

(U) Property Control of (Perfluorinated Ionomer)/  
(Inorganic Oxide) Composites by Tailoring the  
Nanoscale Morphology.

DESCRIPTIVE NOTE: Final rept. 1 Feb 93-31 Jan 94,

JAN 94 336P

DESCRIPTIVE NOTE: Annual rept. no. 1, Apr 93-31 Mar 94,

PERSONAL AUTHORS: Gilson, Richard D.

JUN 94 158P

CONTRACT NO. F49620-93-1-0132

PERSONAL AUTHORS: Mauritz, Kenneth A.; Moore, Robert B.

PROJECT NO. 2313

CONTRACT NO. F49620-93-1-0189

TASK NO. BS

PROJECT NO. 2303

MONITOR: AFOSR, XC  
TR-94-0418, AFOSR

TASK NO. CS

MONITOR: AFOSR, XC  
TR-94-0417, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) Decisions, whose appropriateness depends on knowledge and rules, are expected more or less effectively depending on the psychomotor skills of the operator. If these are sequential rather than parallel processes, and it seems to me that they must be even though they may be carried out very quickly, then in some cases we may be able to infer decision from action, and gestalt from decision, as long as we understand that the cognitive centroid of the individual operator is idiosyncratic and unknowable to some degree. Training can help to improve perception: it can also help to standardize the decisions taken in a given situation. The comprehension and integration of sensed data can also be improved by training, practice and criticism. The changes brought about by carefully targeted training can be observed and can also help us to underlying processes.

DESCRIPTORS: (U) \*OPERATORS(PERSONNEL), \*PSYCHOMOTOR TESTS, \*SKILLS, AWARENESS, COGNITION, DECISION MAKING, COCKPITS, AIR TRAFFIC CONTROL SYSTEMS, METEOROLOGY, EMERGENCIES, CRISIS MANAGEMENT, TEAMS(PERSONNEL).

IDENTIFIERS: (U) PEG1102F, WUAFOSR2313BS.

Availability: Microfiche copies only.

ABSTRACT: (U) Unique perfluoro-organic/inorganic oxide hybrid materials have been formulated by merging processes recently developed by us for the solution and melting processing of perfluorosulfonate ionomers (PFSI's) and (2) the production of nanocomposites by the in situ sol-gel reaction for silicon and metal alkoxides within the polar clusters of PFSI's. Our working hypothesis is that the resultant morphology of the inorganic phased is ordered by the nanophase-separated morphology of the PFSI matrix. In this research, the 3-dimensional morphological template presented by the PFSI is tailored by manipulating the primary polymer structure, polymer solution conditions, film casting procedure, and post-solution processing (e.g. drying, annealing, melt-quenching, mechanical orientation). The nanocomposites are then characterized for microstructure broadly ranging from light microscopic resolution down to the level of Angstroms using various microscopic, scattering, diffraction and spectroscopic methods

DESCRIPTORS: (U) \*COMPOSITE MATERIALS, \*FLUORINATED HYDROCARBONS, \*IONOMERS, \*INORGANIC COMPOUNDS, \*OXIDES, \*SULFONATES, MORPHOLOGY, POLYMERS, SILICON DIOXIDE,

AD-A281 448

AD-A281 370

UNCLASSIFIED

PAGE 104

T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A281 370 CONTINUED

AD-A281 369 20/3 20/5 20/13 7/4

HYBRID SYSTEMS, MELTING, PROCESSING, CHEMICAL REACTIONS, METALS, PHASE, ESTERS, SOLUTIONS(MIXTURES), FILMS, CASTING, MICROSTRUCTURE, MICROSCOPY, SCATTERING, DIFFRACTION, SPECTROSCOPY, TITANIUM DIOXIDE, ALUMINUM OXIDES, DEGRADATION, THERMAL ANALYSIS.

CORNELL UNIV ITHACA NY LAB OF ATOMIC AND SOLID STATE PHYSICS

(U) Resonant Charge Transfer in Hyperthermal Atomic and Molecular Ion-Surface Collisions.

IDENTIFIERS: (U) PE61102F, \*Perfluorinated, Tailoring, \*Nanoscale, Perfluorosulfonate, PFSI, Nanocomposites, Sol gel process, Alkoxides, Polar clusters, Property control, In situ, Nations.

DESCRIPTIVE NOTE: Annual rept. 1 Jan 93-1 Apr 94,

APR 94 30P

PERSONAL AUTHORS: Cooper, B. H.

CONTRACT NO. AFOSR-91-0137

PROJECT NO. 2303

TASK NO. BC

MONITOR: AFOSR, XC  
TR-94-0390, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) We are investigating the interactions of hyperthermal energy (few to several hundred eV) atomic ions with metal surfaces, focusing on ion-surface charge exchange processes. For Li<sup>+</sup> scattering from alkali-covered Cu(001), we have measured branching ratios for Li<sup>+</sup>, Li<sup>-</sup> and ground- and excited-state Li deg in the scattered flux. These results are interpreted using a state-of-the-art multi-channel charge transfer code developed by Brad Marston. Using this code, we have gained important insights into the dynamics of multi-channel charge transfer processes. We are extending these studies to higher-lying excited states of Li, excited state formation in Na scattering, and multi-channel charge transfer in O scattering. For Na<sup>+</sup> scattering from clean Cu(001) we have observed trajectory-dependent charge transfer in which the charge transfer probability is dependent on the collisional history of the particle; evidence is found for modification of the neutralization due to defect formation that can occur in certain types of collisions with the surface. We plan to study trapping behavior for hyperthermal energy alkalis and oxygen incident on metal surfaces. Charge transfer, Hyperthermal energy ion scattering, Classical trajectory simulations, Atomic and molecular ions, Hyperthermal oxygen beams, Neutral detection, Scattering dynamics, Energy transfer,

AD-A281 370

AD-A281 369

UNCLASSIFIED

PAGE 105

T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A281 369 CONTINUED

AD-A281 352 11/6.1

Particle trapping

CORNELL UNIV ITHACA NY DEPT OF MATERIALS SCIENCE AND  
ENGINEERING

DESCRIPTORS: (U) \*CHARGE TRANSFER, \*COLLISIONS,  
\*RESONANCE, \*ATOMIC PROPERTIES, \*MOLECULAR IONS,  
\*SURFACES, CHANNELS, DETECTION, DYNAMICS, ENERGY TRANSFER,  
EXCHANGE, FOCUSING, INTERACTIONS, IONS, METALS,  
MODIFICATION, LITHIUM, ALKALI METALS, NEUTRAL,  
NEUTRALIZATION, OXYGEN, PARTICLES, PROBABILITY, PARTICLE  
BEAMS, RATIOS, SCATTERING, SIMULATION, TRAPPING(CHARGED  
PARTICLES), EXCITATION, STATIC ELECTRICITY, TRAJECTORIES,  
COPPER, ELECTRONS, GROUND STATE, FLUX(RATE), SODIUM.

(U) Cornell Program for the Design and Synthesis of  
Advanced Materials.

DESCRIPTIVE NOTE: Annual rept. no. 1 May 93-30 Apr 94,

MAY 94 48P

PERSONAL AUTHORS: Sass, Stephen L.

REPORT NO. TR-5

CONTRACT NO. F49620-93-1-0235

MONITOR: AFOSR, XC  
TR-94-0412, AFOSR

UNCLASSIFIED REPORT

IDENTIFIERS: (U) PE61102F, Branching ratios,  
\*Hyperthermal energy.

DESCRIPTORS: (U) \*NICKEL ALLOYS, \*CRACKING(FRACTURING),  
CERAMIC MATRIX COMPOSITES, BRITTLENESS, DISPERSION  
HARDENING, THERMAL EXPANSION, THERMAL STRESSES,  
MICROSTRUCTURE, PROCESSING, SYNTHESIS, GRAIN BOUNDARIES,  
TOUGHNESS, HIGH TEMPERATURE.

AD-A281 369

AD-A281 352

UNCLASSIFIED

PAGE 106 T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. T4035K

AD-A281 350

20/6

9/5

7/6

CALIFORNIA INST OF TECH PASADENA

(U) Systematic Optimization of Second Order Nonlinear Optical Materials.

DESCRIPTIVE NOTE: Annual rept. 1 May 93-30 Apr 94,

JUN 94

23P

PERSONAL AUTHORS: Marder, Seth

CONTRACT NO. F49620-93-1-0314

PROJECT NO. 1601

TASK NO. 06

MONITOR: AFOSR, XC  
Tr-94-0410, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) We have developed a new compounds with a thiophene bridge and an acceptors that gain aromaticity, such as 3-phenyl-5-isoxazolone, diphenylthiobarbituric acid. These compounds have a large second-order nonlinearity roughly tens time that of the common dye Disperse-Red 1) and good thermal stability and are therefore a promising candidates for electro-optic poled polymer applications.

DESCRIPTORS: (U) \*POLYMERS, \*THIOPHENES, \*ELECTROOPTICS, \*OPTICAL MATERIALS, \*AROMATIC COMPOUNDS, ACIDS, DYES, GAIN, OPTICS, THERMAL STABILITY, NONLINEAR OPTICS, PHOTONICS, CHROMOPHORES.

IDENTIFIERS: (U) PE63218C

AD-A281 350

UNCLASSIFIED

PAGE 107

T4035K

SEARCH CONTROL NO. T4035K

AD-A281 336

5/8

YALE UNIV NEW HAVEN CT

(U) Presentations of Shape in Object Recognition and Long-Term Visual Memory.

DESCRIPTIVE NOTE: Annual rept. 15 Jan 93-14 Jan 94,

APR 94

22P

PERSONAL AUTHORS: Tarr, Michael J.

CONTRACT NO. F49620-92-J-O169

PROJECT NO. 2313, 2313

TASK NO. AS, BS

MONITOR: AFOSR, XC  
TR-94-0413, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) A wide range of psychophysical experiments investigating the mechanisms and representations underlying human object recognition have been conducted. In particular, the focus of this research has been an approach in which object recognition is mediated by at least two systems, one based on an explicit qualitative encoding of viewpoint-invariant features and one based on a metrically specific encoding of shape. Within the literature, this dichotomy has been most often associated with measures of the effect of viewpoint on recognition performance. For the most part, the common assumption has been that viewpoint-dependent patterns of performance are the signature of one recognition mechanism, while viewpoint-invariant patterns of performance are in the signature of another recognition mechanism. Reinforcing this distinction, viewpoint-dependent mechanisms have been more broadly associated with metrically specific representations sensitive to a range of image-based properties, for example, size, handedness, color, or illumination, while viewpoint invariant mechanisms have been more broadly associated with coarsely-coded representations insensitive to image based properties. To this point, the majority of work on this project has focused only on the former in recognition tasks where perceivers must discriminate between visually similar objects (e.g., a within-category or subordinate-level

AD-A281 336

UNCLASSIFIED

PAGE 107

T4035K



UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A281 336 CONTINUED

AD-A281 324 20/3 20/11

judgment). During the past year we have continued this line of research, but have extended our approach to include recognition tasks using objects that are relatively dissimilar in that they may be differentiated by a small number of quantitatively different parts (e.g., a between-category or entry-level judgment). Object representation, Object recognition, Visual cognition.

DESCRIPTORS: (U) \*VISUAL PERCEPTION, \*PATTERN RECOGNITION, CODING, COLORS, HUMANS, ILLUMINATION, IMAGES, MAJORITIES, NUMBERS, PATTERNS, RECOGNITION, SHAPE, SIGNATURES, WORK, PSYCHOPHYSIOLOGY, COGNITION.

IDENTIFIERS: (U) PES1102F, WUAFOSR2313AS, WUAFOSR2313BS.

INDIANA UNIV AT BLOOMINGTON DEPT OF CHEMISTRY

(U) Electric Field Dependence of Young's Modulus of (TMTSF) 2PF6,

93 7P

PERSONAL AUTHORS: Xu, Z. G.; Minton, G.; Brill, J. W.; Burgin, T.; Montgomery, L. K.

CONTRACT NO. F49620-92-J-0534, NSF-DMR89-15440

PROJECT NO. 3484

TASK NO. RS

MONITOR: AFOSR, XC  
TR-94-0407, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Synthetic Metals, n55-57 p2797-2802 1993. Available only to DTIC users. No copies furnished by NTIS.

ABSTRACT: (U) We report on measurements of the Young's modulus (Y) and internal friction (1/Q) in (TMTSF) 2PF6 at 5.5K as functions of electric field. No changes are observed at fields up to 100 E sub T, the threshold for SDW depinning, in contrast to what is observed for many sliding charge-density-wave materials. A possible explanation is that we are not observing bulk depinning of the SDW. Organic superconductor, SDW.

DESCRIPTORS: (U) \*ELECTRIC FIELDS, \*SUPERCONDUCTORS, \*MODULUS OF ELASTICITY, CHARGE DENSITY, FRICTION, INTERNAL FRICTION, SLIDING, ELASTIC PROPERTIES, PHONONS, REPRINTS, SLIDING FRICTION.

IDENTIFIERS: (U) CDW (Charge Density Waves)

AD-A281 336

AD-A281 324

UNCLASSIFIED

PAGE 103 T4035K

UNCLASSIFIED

## DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. T4035K

AD-A281 312 20/11

AD-A281 311 7/4 7/2 20/5 12/3

VIRGINIA POLYTECHNIC INST AND STATE UNIV BLACKSBURG

CALIFORNIA UNIV SAN DIEGO LA JOLLA DEPT OF CHEMISTRY

(U) Energy Decay and Control for Elastic and Viscoelastic Distributed Parameter Systems.

(U) Chemisorption Energetics of Superactive Chlorine Containing Species on Gallium Arsenide Surfaces.

DESCRIPTIVE NOTE: Final rept. 15 Nov 90-14 Apr 94,

DESCRIPTIVE NOTE: Final rept. 15 Mar-14 Dec 93.

JUN 94 13P

DEC 93 5P

PERSONAL AUTHORS: Hannsgen, Kenneth B.; Wheeler, Robert L.

PERSONAL AUTHORS: Kummel, Andrew C.

CONTRACT NO. AFOSR-91-0083

CONTRACT NO. F49620-93-1-0176

MONITOR: AFOSR, XC

PROJECT NO. 2303

TR-94-0391, AFOSR

TASK NO. BS

UNCLASSIFIED REPORT

MONITOR: AFOSR, XC  
TR-94-0396, AFOSR

ABSTRACT: (U) Research is reported on the dynamic behavior of viscoelastic structures, with emphasis on the interaction between passive damping and active feedback control mechanisms. A main focus is the approximation of optimal compensators for simple mechanical systems involving viscoelastic elements by realizable compensators. In the frequency domain, this corresponds to the mathematical problem of approximating a transcendental function by a rational one, under suitable stability constraints and performance criteria. The work involves the analytic study of partial product approximations to transfer functions for rods and beams, as well as a mainly numerical study concerned with replacing the complex modulus for the viscoelastic material by a rational function that reflects the most significant properties of the material. A second focus of the research is a new formula that makes clear the relation between initial data and the smoothness and decay rates of solutions of the equations for a viscoelastic system with stabilizing boundary feedback.

DESCRIPTORS: (U) \*VISCOELASTICITY, \*ELASTIC PROPERTIES, BEHAVIOR, BOUNDARIES, COMPENSATORS, CONTROL, DAMPING, DECAY, DYNAMICS, FREQUENCY DOMAIN, INTERACTIONS, RATIONAL FUNCTIONS, RODS, STABILITY, TRANSCENDENTAL FUNCTIONS, TRANSFER FUNCTIONS, STRAIN(MECHANICS), BANACH SPACE, APPROXIMATION(MATHEMATICS).

IDENTIFIERS: (U) PE61102F

AD-A281 312

AD-A281 311

UNCLASSIFIED

PAGE 109

T4035K

UNCLASSIFIED REPORT

ABSTRACT: (U) The chemisorption mechanisms of Cl<sub>2</sub>, Br<sub>2</sub>, and I<sub>2</sub> on Si(100) 2x1 are quite similar while those of F<sub>2</sub> and O<sub>2</sub> are quite distinct. For the heavy diatomic halogens (Cl<sub>2</sub>, Br<sub>2</sub>, and I<sub>2</sub>), the sticking probability increases with incident translation energies above 0.1 eV, and the largest initial sticking probabilities are obtained at the highest incident energies, with S sub 0, equal to 95 - 100% for I<sub>2</sub> and Br<sub>2</sub>, at low incident energies the initial sticking probability, S<sub>0</sub>, decreases with increasing surface temperature while at high incident energies the sticking probability is independent of surface temperature. In addition, for Cl<sub>2</sub> very low energy molecular beams can be prepared, and the sticking probability is observed to decrease with increasing incident energies between 0.02 eV and 0.06 eV. Therefore, all these heavy diatomic halogens can adsorb via precursor - mediated chemisorption at low incident translation energy and via direct - activated chemisorption activated chemisorption at high incident translational energy. For all incident kinetic energies, the chemisorption probability decreases linearly with coverage (S=S<sub>0</sub>(1-Theta)) for the three diatomic halogen gases. This suggests that a single site is required to initiate the direct chemisorption process and the precursor is intrinsic.

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A281 311 CONTINUED

AD-A281 310 6/4 6/1

DESCRIPTORS: (U) \*CHEMISORPTION, \*SURFACES, \*ENERGETIC PROPERTIES, \*CHLORINE, \*GALLIUM ARSENIDES, ENERGY, HALOGENS, KINETICS, LOW ENERGY, MOLECULAR BEAMS, PRECURSORS, PROBABILITY, SILICON, SITES, SURFACE TEMPERATURE, TEMPERATURE, TRANSLATIONS, BROMINE, FLUORINE, OXYGEN, IODINE, SULFUR OXIDES, ADSORPTION, DIATOMIC MOLECULES.

WRIGHT STATE UNIV KETTERING OH DEPT OF BIOCHEMISTRY  
(U) Hepatic Toxicity of Perfluorocarboxylic Acids.

DESCRIPTIVE NOTE: Annual rept. 1 Jun 93-31 May 94,

JUN 94 5P

IDENTIFIERS: (U) PE61102F, \*Superactive, Species, Incident, Sticking.

PERSONAL AUTHORS: Reo, Nicholas V.

CONTRACT NO. F49620-92-J-0218

PROJECT NO. 3484

TASK NO. S4

MONITOR: AFOSR, XC  
TR-94-0400, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The goal of this study was to determine the effect of PFDA on hepatic glucose transport in perfused rat livers using a paired-tracer first-pass extraction technique. This work was performed in collaboration with LCDR John Wyman, Ph.D, of the Naval Medical Research Institute, Wright-Patterson AFB. Carol learned the perfusion techniques, coordinated all aspects of the data acquisition, and was solely responsible for data processing. This project was described in detail in the Annual Report for AFOSR-90-0148 which was submitted January 5, 1994. Therefore, only a very brief discussion of the work is given herein.

DESCRIPTORS: (U) \*ACIDS, \*CARBOHYDRATE METABOLISM, \*METABOLISM, \*TOXICITY, \*LIVER, ACQUISITION, DATA ACQUISITION, DATA PROCESSING, EXTRACTION, GLUCOSE, MEDICAL RESEARCH, PERFUSION, PROCESSING, RATS, TRANSPORT, WORK, SYNTHESIS, SPECTROSCOPY.

IDENTIFIERS: (U) PE61103D, \*Perfluorocarboxylic acids, Hepatic toxicity.

AD-A281 311

AD-A281 310

UNCLASSIFIED

PAGE 140 T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A281 308

7/3 7/4

AD-A281 308 CONTINUED

INDIANA UNIV AT BLOOMINGTON DEPT OF CHEMISTRY

(U) Design and Synthesis of Organic Superconductors (FY92 URI/RIP).

DESCRIPTIVE NOTE: Annual rept. 1 Oct 92-30 Sep 93,

OCT 93 8P

PERSONAL AUTHORS: Montgomery, Lawrence K.

CONTRACT NO. F49620-92-J-0534

PROJECT NO. 3484

TASK NO. RS

MONITOR: AFOSR, XC  
TR-94-0403, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) A number of mixed-valence (2:1), conducting salts of bis(ethylenedithio)tetraselenafulvalene (BETS) have been prepared. Four  $\text{GaCl}_4$ ,  $\text{SbF}_6$ ,  $\text{CF}_3\text{SO}_3$  and  $\text{CuN}(\text{CN})(2)\text{Br}$  have been characterized in detail (X-ray crystallography, DC resistivity from 300-1 OK, rf penetration depth measurements (0.5K), pressure studies from 0.5-5 kbar at 4K, and tight-binding band calculations). The salts are highly metallic to low temperatures but do not exhibit superconductivity under the experimental conditions explored. The synthesis of a new synthetic metal precursor, bis(ethylenedithio)tetrathionaphthalene (BEDT-TTN), is about three-quarters completed. Spin density wave (SDW) and charge density wave (CDW) phenomena of three organic superconductors ( $\text{k}-(\text{BEDT-TTF})\text{CuN}(\text{CN})(2)\text{Cl}$ ,  $(\text{TMTSF})_2\text{PF}_6$ , and  $(\text{TMTSF})_2\text{ReO}_4$ ), where BEDTTF is bis(ethylenedithio)tetrathiafulvalene and TMTSF is tetramethyltetraselenafulvalene) have been studied in collaboration with Professor J.W. Brill (Department of Physics, University of Kentucky). The three organic metals avert the SDW and CDW transitions under pressure and become superconductors. Organic superconductor, Synthesis, Structure, Resistivity, SDW, CDW.

DESCRIPTORS: (U) \*SUPERCONDUCTORS, \*SYNTHESIS(CHEMISTRY), CHARGE DENSITY, CRYSTALLOGRAPHY, DENSITY, DEPTH, KENTUCKY,

AD-A281 308

AD-A281 308

UNCLASSIFIED

PAGE 111

T4035K

MEASUREMENT, METALS, NUMBERS, PENETRATION, PHYSICS, PRECURSORS, PRESSURE, SALTS, STRUCTURES, SUPERCONDUCTIVITY, TEMPERATURE, TRANSITIONS, UNIVERSITIES, VALENCE, X RAYS, ELECTRICAL CONDUCTIVITY, METALLIC TEXTILES, LOW TEMPERATURE.

IDENTIFIERS: (U) PES1103D, WUAFOSR3484RS.

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A281 307 21/4

AD-A281 307 CONTINUED

DUQUESNE UNIV PITTSBURGH PA

IDENTIFIERS: (U) PEG1102F, WUAFOSR2303DS.

(U) Development of Oxygen Scavenger Additives for Jet Fuels.

DESCRIPTIVE NOTE: Annual rept. no. 1, 1 May 93-30 Apr 94,

MAY 93 10P

PERSONAL AUTHORS: Beaver, Bruce

CONTRACT NO. F49620-93-1-0224

PROJECT NO. 2303

TASK NO. DS

MONITOR: AFOSR, XC  
TR-94-0395, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) In this project it is assumed that the thermal stability of most jet fuels would be dramatically improved by the efficient removal of a fuel's dissolved oxygen (in flight). It is proposed herein to stabilize the bulk fuel by the addition of an additive which will be judiciously designed and programmed to react with oxygen and produce an innocuous product. Consequently, it is envisioned that a thermally activated reaction between the oxygen scavenging additive and dissolved oxygen will occur in a controlled and directed manner, such that formation of insoluble thermal degradation products will be limited. It is believed that successful completion of this project will result in the development of a new type of jet fuel additive which will enable current conventional jet fuels to obtain sufficient thermal stability to function as 'JP-900' fuels. In addition, it is postulated that the successful development of thermally activated oxygen scavengers will also provide the sub-critical thermal stability necessary for future development of endothermic fuels.

DESCRIPTORS: (U) \*FUEL ADDITIVES, \*JET ENGINE FUELS, OXYGEN, REMOVAL, THERMAL DEGRADATION, THERMAL STABILITY, CONCENTRATION(COMPOSITION), FUEL AIR RATIO, SOLVATION, OXIDATION REDUCTION REACTIONS.

AD-A281 307

AD-A281 307

UNCLASSIFIED

PAGE 142 - T4035K

UNCLASSIFIED

## DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. T4035K

AD-A281 306

7/6

NORTHERN ILLINOIS UNIV DE KALB DEPT OF CHEMISTRY

(U) Design Strategies for the Preparation of Polymeric Organic Superconductors.

DESCRIPTIVE NOTE: Annual technical rept. Sep 92-Sep 93,

SEP 92

7P

PERSONAL AUTHORS: Spangler, Charles W.

CONTRACT NO. F49620-92-J-0533

PROJECT NO. 3484

TASK NO. RS

MONITOR: AFOSR, XC  
TR-94-0414, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) This program has, as its stated goal, the design of the first organic polymeric superconductor. In year one we have embarked on the design of several model compounds so as to ascertain the most appropriate synthetic methodology for the polymer systems, and to determine the existence of any potential problems in solubility and processibility parameters in the chosen systems. Upon synthesis the redox properties of the model compounds and their compatibility with various counter ions will be determined, as well as their packing efficiency via x-ray spectroscopy.

DESCRIPTORS: (U) \*SYNTHESIS(CHEMISTRY), \*POLYMERS, \*SUPERCONDUCTORS, COMPATIBILITY, EFFICIENCY, IONS, OXIDATION REDUCTION REACTIONS, PARAMETERS, SOLUBILITY, MONOMERS, PROCESSING, MOLECULAR STRUCTURE, X RAY SPECTROSCOPY.

IDENTIFIERS: (U) REG1103D, WUAFOSR3484RS,  
Electrocrystallization.

AD-A281 306

UNCLASSIFIED

AD-A281 304

20/6

7/1

CALIFORNIA INST OF TECH PASADENA

(U) Materials for Second and Third Order Nonlinear Optical Applications.

DESCRIPTIVE NOTE: Annual rept. 1 Jun 93-31 May 94,

JUN 94

11P

PERSONAL AUTHORS: Marder, Seth

CONTRACT NO. F49620-92-J-0278

PROJECT NO. 3484, 2303

TASK NO. S2, CS

MONITOR: AFOSR, XC  
TR-94-0409, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) We have developed a new synthesis of aldehyde precursors to second and third-order nonlinear optical materials. In this procedure, aldehydes with extended conjugation can be conveniently prepared in one step from organolithium reagents and vinylous amides. We have also synthesized some donor-acceptor substituted thiophenevinylene oligomers that display enhanced optical nonlinearities and that have been incorporated into poled polymer. Although the compounds had large nonlinearities, insolubility precluded incorporating large amounts of the compounds into the host-guest polymer systems. Finally we have synthesized a series of compounds that have allowed us to map out the behavior of the first hyperpolarizability as a function of ground-state polarization and bond length alternation. The ground-state polarization was monitored by infrared spectroscopy using the local vibrational modes of a functional group on the end of the molecule as a probe.

DESCRIPTORS: (U) \*OPTICAL MATERIALS,  
\*SYNTHESIS(CHEMISTRY), \*NONLINEAR OPTICS, ALDEHYDES, AMIDES, GROUND STATE, INFRARED SPECTROSCOPY, LENGTH, OLIGOMERS, POLARIZATION, POLYMERS, PRECURSORS, PROBES, MOLECULAR STRUCTURE, THIOPHENES, ROTATION(CHEMICAL BONDS).

IDENTIFIERS: (U) PE61102F, PE61103D, WUAFOSR2303CS,

AD-A281 304

PAGE 113

T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A281 304 CONTINUED  
WUAFOSR3484S2.

AD-A281 301 12/9 11/4 17/8

BERKELEY APPLIED SCIENCE AND ENGINEERING INC SAN  
FRANCISCO CA

(U) Structural Integrity of Intelligent Materials and  
Structures. Constitutive Modeling of Shape Memory  
Alloys.

DESCRIPTIVE NOTE: Final technical rept. 1 Aug 93-31 Mar  
94,

MAY 94 108P

PERSONAL AUTHORS: Panahandeh, M.; Masud, A.; Auricchio, F.

REPORT NO. 83-148

CONTRACT NO. F49620-93-C-0028

MONITOR: AFOSR, XC  
TR-94-0411, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) A full-scale application of shape memory alloys in intelligent structures requires that the complex interaction between active elements (sensors, actuators, processors) and the host material be investigated and a modeling tool to simulate the behavior of these structures be developed. This research is an effort toward this direction with the following objectives: (1) Development of a constitutive theory for pseudoelastic behavior of shape memory alloys based on phase transformation in these alloys; (2) Extension of the theory to finite kinematics and developments of numerical algorithms for solution of the nonlinear pseudoelastic system; (3) Formulation of a multi-director shell theory for finite element modeling of composite laminates; (4) Numerical implementation of the theory in a suitable finite element program with nonlinear capabilities; (5) Simulation of cyclic loading and partial loading/unloading in shape memory alloys. Sensors, Actuators, Shape memory, Constitutive model, Composite laminate, Large deformation.

DESCRIPTORS: (U) \*ACTUATORS, \*LAMINATES, \*ELASTIC PROPERTIES, \*ARTIFICIAL INTELLIGENCE, \*INFORMATION PROCESSING, \*DETECTORS, ALGORITHMS, ALLOYS, DEFORMATION, INTERACTIONS, KINEMATICS, MATERIALS, PHASE

AD-A281 304

AD-A281 301

UNCLASSIFIED

PAGE 114 T4035K



UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A281 301 CONTINUED

AD-A281 284 23/2 17/5 6/4

TRANSFORMATIONS, SHAPE, SIMULATION, SHELLS(STRUCTURAL FORMS), FINITE ELEMENT ANALYSIS, COMPOSITE MATERIALS, CYCLIC LOADS, AUSTENITE, MARTENSITE, MECHANICAL PROPERTIES, OPTICAL PROPERTIES, THERMAL PROPERTIES, ELECTROMAGNETIC PROPERTIES, CHEMICAL PROPERTIES, MATRIX MATERIALS, STRESS STRAIN RELATIONS, MICROELECTRONICS.

MARYLAND UNIV COLLEGE PARK OFFICE OF RESEARCH ADMINISTRATION AND ADVANCEMENT

(U) Coordinated Action in 3-D Space.

DESCRIPTIVE NOTE: Final rept. 15 Dec 90-31 Mar 94,

IDENTIFIERS: (U) Structural integrity, \*Smart materials, Smart structures, Shape memory alloys

MAY 94 6P

PERSONAL AUTHORS: Steinman, Robert M.

CONTRACT NO. AFOSR-91-0124

PROJECT NO. 2323

TASK NO. CS

MONITOR: AFOSR, XC  
TR-94-0401, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) Unique hardware and novel software were developed to study natural patterns of head and eye movements during inspection and manipulation of objects in nearby 3-D space. Emphasis was placed on natural tasks in which subjects looked at and handled real objects in a natural visual environment with the head and torso free to move naturally. Two quite different mechanistic models of gaze control were tested: (a) an 'on-line' feedback model and (b) a 'single packet' model that bases accurate gaze control on preplanned patterns of coordinated movements of the head and eyes. We found that the VOR was not turned-off during gaze-shifts, as currently believed, but that it was not effective in compensating for abrupt displacements of the head as had been believed previously. The speed and accuracy of button presses produced by tapping and the correlation of these performance measures with binocular gaze-errors were also studied. These studies were performed to determine how accurate binocular fixation must be in order to insure rapid and accurate tapping in nearby 3-D space. We found that effective performance was possible with binocular gaze-errors about the size of the human fovea (2 deg - 3 deg). VOR, Gaze-shifts, Fixation accuracy, Visuomotor.

DESCRIPTORS: (U) \*BINOCULARS, \*EYE MOVEMENTS, \*HUMAN FACTORS ENGINEERING, ACCURACY, CONTROL, CORRELATION,

AD-A281 301

AD-A281 284

UNCLASSIFIED

PAGE 115

T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. T4035K

AD-A281 284 CONTINUED

AD-A281 283 20/6 7/1 7/6

DISPLACEMENT, VISUAL INSPECTION, ERRORS, FEEDBACK, FOVEA, TARGET RECOGNITION, THREE DIMENSIONAL, HEAD(ANATOMY), PATTERNS, VELOCITY, VISUAL PERCEPTION, RESPONSE(BIOLOGY), REFLEXES.

NORTHWESTERN UNIV EVANSTON IL

(U) Rational Design, Construction, and Processing of High-Performance Nonlinear, Optical Materials.

IDENTIFIERS: (U) PE61102F, WUAFOSR2313CS, Gaze shifts, \*VOR(Vestibule Ocular Reflex).

DESCRIPTIVE NOTE: Final rept. 1 Dec 92-28 Feb 94,

JUN 94 14P

PERSONAL AUTHORS: Marks, T. J.; Wong, G. K.; Ratner, M. A.

CONTRACT NO. F49620-93-1-0114

PROJECT NO. 2303

TASK NO. CS

MONITOR: AFOSR, XC  
TR-94-0416, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) This project consists of a collaborative synthetic, processing, physical characterization, and theoretical program aimed at the rational design, construction, evaluation, and fundamental understanding of new types of maximum-performance molecule/polymer-based materials exhibiting high second-order (X(2)) optical nonlinearities. Areas of emphasis include poled chromophore-embedded glassy polymers, poled chromophore-embedded crosslinkable matrices, chromophoric self-assembled superlattices, the theoretical design and analysis of novel chromophores and chromophore environments, theoretical studies of poling dynamics, studies of optical damage phenomena, and fabrication of new types of NLO waveguides. Each research component of this highly interactive effort builds upon work already in progress as well as upon strong on-going collaborations in laser optics and quantum theory. Nonlinear optical material, Polymer, Chromophore, Crosslinking, Self-assembly, Second harmonic generation.

DESCRIPTORS: (U) \*CHROMOPHORES, \*OPTICAL MATERIALS, \*NONLINEAR OPTICS, \*CROSSLINKING(CHEMISTRY), ASSEMBLY, FABRICATION, LASERS, POLYMERS, PROCESSING, SECOND HARMONIC GENERATION, SUPERLATTICES, WAVEGUIDES, SYNTHESIS(CHEMISTRY), MOLECULAR STRUCTURE, OPTIMIZATION, QUANTUM CHEMISTRY, POLARIZATION.

AD-A281 284

AD-A281 283

UNCLASSIFIED

PAGE 116 - T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A281 283 CONTINUED

AD-A281 224 20/8

INDIANA UNIV AT BLOOMINGTON DEPT OF CHEMISTRY

IDENTIFIERS: (U) PE61102F, WUAF0SR2303CS.

(U) Synthesis, Superconductivity, X-ray Structure and Electronic Band Structure of Wavelengths-(BETS)2GaCl4,

94 10P

PERSONAL AUTHORS: Montgomery, L. K.; Burgin, T.; Huffman, J. C.; Ren, J.; Whangbo, M. -H.

CONTRACT NO. F49620-92-J-0534

PROJECT NO. 3484

TASK NO. RS

MONITOR: AFOSR, XC  
TR-94-0405, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The first superconductor derived from bis(ethylenedithio)tetraselenafulvalene (BETS), Lambda-(BETS)2GaCl4, possesses a relatively sharp resistive transition with an onset of about 7.5 K and a midpoint of 6 K. Several samples had much broader transitions with higher onsets (>9 K). Superconductivity was confirmed by AC susceptibility (midpoint 4.5 K, AT = 1 K). Lambda-(BETS)2GaCl4 crystallizes in the monoclinic space group PI, with four BETS units stacked in a zig-zag fashion in the unit cell. Tight-binding band calculations suggest that Lambda-(BETS)2GaCl4 has both 1-D and 2-D Fermi surfaces, the most prominent feature being a closed hole pocket centered at X accounting for approx. 33% of the first Brillouin zone. These results confirm the recent findings of Kobayashi and coworkers. Organic superconductor, Resistivity, Meissner effect

DESCRIPTORS: (U) \*SUPERCONDUCTIVITY, \*X RAYS, ACCOUNTING, BRILLOUIN ZONES, CELLS, FERMI SURFACES, REGIONS, SUPERCONDUCTORS, SURFACES, TRANSITIONS, ELECTRONICS, BAND SPECTRA, BRILLOUIN ZONES, STRUCTURES.

IDENTIFIERS: (U) PE61103D, WUAF0SR3484RS,  
Bis(ethylenedithio)tetraselenafulvalene(BETS)

AD-A281 283

AD-A281 224

UNCLASSIFIED

PAGE 117

T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A281 219 12/3

AD-A281 213 12/1

BROWN UNIV PROVIDENCE RI DIV OF APPLIED MATHEMATICS

WAKE FOREST UNIV WINSTON-SALEM NC DEPT OF MATHEMATICS

(U) Stochastic Control and Nonlinear Estimation.

(U) Least Squares Computations in Science and Engineering.

DESCRIPTIVE NOTE: Final technical rept. 1 Apr 92-31 Mar 94,

DESCRIPTIVE NOTE: Final rept. 1 Feb 91-31 Jan 94,

MAY 94 5P

FEB 94 18P

PERSONAL AUTHORS: Fleming, Wendell H.; Kushner, Harold J.

PERSONAL AUTHORS: Plemmons, Robert J.

CONTRACT NO. F49620-92-J-0081

CONTRACT NO. AFOSR-91-0163

MONITOR: AFOSR, XC  
TR-94-0393, AFOSR

PROJECT NO. 2304

TASK NO. DS

UNCLASSIFIED REPORT

MONITOR: AFOSR, XC  
TR-94-0392, AFOSR

ABSTRACT: (U) W.H. Fleming's work during this period concerned risk sensitive stochastic control, and related questions about differential games. This theory-provides a link between stochastic and deterministic (robust control) approaches to disturbance attenuation problems. H.J.Kushner's work developed efficient, general stochastic approximation methods for improving the operation of continuous or discrete event dynamical systems over a long time period. Applications to communication problems include large controlled multiplexing systems, which are approximated by diffusion type processes. The method yields a very efficient way of approximation as well as good numerical methods.

DESCRIPTORS: (U) \*ESTIMATES, \*NONLINEAR ANALYSIS, \*STOCHASTIC CONTROL, APPROACH, ATTENUATION, CONTROL THEORY, DIFFUSION, GAME THEORY, MULTIPLEXING, RISK, THEORY, TIME.

UNCLASSIFIED REPORT

ABSTRACT: (U) Least squares computations constitute a fundamental tool in science and engineering. The reason is that they play a critical role in fitting numerical models to real world observations. This AFOSR supported research effort has been concerned with the design and testing of new algorithms for least squares computations and optimization in science and engineering. The objectives were to mathematically develop, test, and analyze fast numerical algorithms for the efficient solution to problems on modern high performance computers. The focus of this project was the application of scientific computing technology in the area of signal and image processing. Very many problems lead to over determined systems of linear or nonlinear equations that are often solved by least squares or related optimization methods. Generally, the problems are accompanied by constraints, such as bound constraints, and the observations are corrupted by noise. The project has involved the application of scientific computing in the area of computational linear and nonlinear least squares methods with particular applications in image and signal processing, where recovering images is often an ill-posed inverse problem. Additional work included control computations associated with adaptive optics. Constrained least squares, Adaptive filtering, Adaptive optics, Deconvolution, Image restoration, Parallel algorithms, Trace maximization, Inverse problems, FFT.

AD-A281 219

AD-A281 213

UNCLASSIFIED

PAGE 118 T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A281 213 CONTINUED

AD-A281 204 6/4

CHICAGO UNIV IL DEPT OF MEDICINE

DESCRIPTORS: (U) \*COMPUTATIONS, \*COMPUTERIZED TOMOGRAPHY, \*LEAST SQUARES METHOD, ADAPTIVE OPTICS, ALGORITHMS, COMPUTERS, CONTROL, ENGINEERING, EQUATIONS, FILTRATION, MATHEMATICAL MODELS, IMAGE PROCESSING, IMAGE RESTORATION, IMAGES, MODEMS, THREE DIMENSIONAL, NOISE, OBSERVATION, OPTICS, OPTIMIZATION, SIGNAL PROCESSING, SIGNALS, TEST AND EVALUATION, TOOLS.

(U) Phase-Shifting Effects of Light and Activity on the Human Circadian Clock.

DESCRIPTIVE NOTE: Final rept. 1 Mar 93-28 Feb 94,

FEB 94 19P

IDENTIFIERS: (U) WUAFOSR2304DS.

PERSONAL AUTHORS: Van Cauter, Eve

CONTRACT NO. F49620-93-1-0188

PROJECT NO. 2312

TASK NO. CS

MONITOR: AFOSR, XC  
TR-94-0399, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) While still preliminary, the findings from this study have provided two important novel observations (1) an overall elevation of TSH levels is a biological concomitant of the 'jet lag syndrome'; (2) exposure to dark/sleep is capable of exerting immediate phase-shifting effects of human rhythms.

DESCRIPTORS: (U) \*SLEEP, \*CIRCADIAN RHYTHMS, ELEVATION, HUMANS, OBSERVATION, PHASE, SHIFTING, SIGNS AND SYMPTOMS, EXPOSURE(PHYSIOLOGY), POTENCY.

IDENTIFIERS: (U) PE61102F, WUAFOSR2312CS.

AD-A281 213

AD-A281 204

UNCLASSIFIED

PAGE 119

T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A281 158 8/11 12/5 AD-A281 156 9/1 12/1 7/4 20/10

TEXAS UNIV AT AUSTIN INST FOR GEOPHYSICS

SCIENTIFIC RESEARCH ASSOCIATES INC GLASTONBURY CT

(U) AASERT-92 Observational Analysis of the Origin of Non-Double Couple Seismic Sources.

(U) Numerical Studies of Low Temperature Gallium Arsenide Buffer Layers and Their Influence on Device Operation.

DESCRIPTIVE NOTE: Annual rept. 1 Jun 93-31 May 94,

DESCRIPTIVE NOTE: Final rept. 1 Oct 93-1 Apr 94,

MAY 94 2P

JUN 94 36P

PERSONAL AUTHORS: Frohlich, Cliff

PERSONAL AUTHORS: Grubin, Harold L.; Kreskovsky, John P.

CONTRACT NO. F49620-93-1-0368

REPORT NO. SRA-R94-9134-F

PROJECT NO. 3484

CONTRACT NO. F49620-91-C-0016

TASK NO. YS

PROJECT NO. 2305

MONITOR: AFOSR, XC  
TR-94-0394, AFOSR

TASK NO. BS

MONITOR: AFOSR, XC  
TR-94-0402, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) The funding in ASSERT Grant NO F49620-93-1-0368 is primarily for Paul Nyffenegger, a graduate student at the University of Texas at Austin. He has been working with a colleague, Lian-She Zhao, to modify a computer program to construct synthetic seismograms using the reflectivity method so that he can evaluate broadband non-double-couple signals, and comparing his primarily results with data for small earthquakes in California. He continues to collect data for specific large, non-double earthquakes from the IRIS DMS data archives in Seattle. We expect to present some preliminary results from this research at the Air Force meetings in New York in September.

DESCRIPTORS: (U) \*COMPUTER PROGRAMS, \*EARTHQUAKES, \*SEISMOGRAPHS, AIR FORCE, ARCHIVES, CALIFORNIA, SEISMIC SIGNATURES, DATA ACQUISITION, REFLECTIVITY.

IDENTIFIERS: (U) WUAFOSR3484YS, PE61103D.

ABSTRACT: (U) Through the use of numerical methods involving both the drift and diffusion equations including traps, and more recently the quantum Liouville equation, Scientific Research Associates, Inc., (SRA) has been examining the physics and operation of LTG materials and devices. Both defect and Schottky models have been studied, and two-dimensional microscopic and macroscopic device simulations have been performed. A new generalization of the drift and diffusion equations, including current, has been implemented for the specific purpose of treating embedded metallic precipitates. This document summarizes SRA work under U.S. Air Force, Office of Scientific Research, Contract F49620-91-C-0023. Gallium arsenide, Low temperature, Precipitates, Defects, Traps, Buried schottky barriers.

DESCRIPTORS: (U) \*BUFFERS, \*LAYERS, \*GALLIUM ARSENIDES, \*LOW TEMPERATURE, \*NUMERICAL METHODS AND PROCEDURES, AIR FORCE, BARRIERS, DIFFUSION, QUANTUM THEORY, DEFECT ANALYSIS, DRIFT, EQUATIONS, SCHOTTKY BARRIER DEVICES, METALS, LIOUVILLE EQUATION, MATERIALS, MODELS, SEMICONDUCTOR DEVICES, OPERATION, PHYSICS, PRECIPITATES, SIMULATION, TEMPERATURE, EMBEDDING, DENSITY, TRAPS, TWO DIMENSIONAL, VALENCE BANDS, ENERGY, CONDUCTIVITY.

AD-A281 158

AD-A281 156

UNCLASSIFIED

PAGE 120 ~

T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A281 156 CONTINUED

AD-A281 119 7/4 20/13 7/3 20/3

INDIANA UNIV AT BLOOMINGTON DEPT OF CHEMISTRY

IDENTIFIERS: (U) PEG1102F, WJAFOSR2305BS, Clusters,  
LTG(Low Temperature Gallium Arsenides).

(U) Thermodynamics of the Anion Ordering Transitions in  
(TMTSF)2ReO4 and (TMTSF)2BF4,

OCT 93 9P

PERSONAL AUTHORS: Chung, M.; Figueroa, E.; Kuo, Y. -K.;  
Wang, Yiqin; Brill, J. W.

CONTRACT NO. F49620-92-J-0534

PROJECT NO. 3484

TASK NO. RS

MONITOR: AFOSR, XC  
TR-94-0408, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Physical Review B, v48 n13 p9256-9263, 1 Oct 93. Available to DTIC users only. No copies furnished by NTIS.

ABSTRACT: (U) We have studied the anion ordering transitions in the Bechgaard salts, (TMTSF)2ReO4 and (TMTSF)2BF4 using ac calorimetry, differential scanning calorimetry, and the vibrating-reed technique. An analysis of the sensitivity of ac calorimetry to (distributed) molar latent heat  $l(T)$  is presented. For the ReO4 salt, the transition is weakly first order, exhibiting no sluggishness or hysteresis. The effective specific heat measured using ac calorimetry, i.e.,  $c$  sub  $p+dI/dT$ , exhibits a lambda-like anomaly, but the entropy of the transition is sample dependent and generally less than the expected value,  $R \ln(2)$ . In comparison, the transition is sluggish for the tetrafluoroborate salt, so that only a lower limit on the entropy could be determined. The thermal anomalies are compared to the anomalies observed using the vibrating-reed technique; the latter are affected by changes in the lattice constants as well as the Young's moduli at the transitions. Organic superconductor, Thermodynamics.

DESCRIPTORS: (U) \*ANIONS, \*RHENIUM, \*OXIDES, \*BORON, \*FLUORIDES, \*SUPERCONDUCTORS, \*THERMODYNAMICS, \*TRANSITIONS, ANOMALIES, CALORIMETRY, COMPARISON,

AD-A281 156

AD-A281 119

UNCLASSIFIED

PAGE 121

T4035K



UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A281 119 CONTINUED

AD-A281 118 7/6 7/3 7/4 20/3

REPRINTS, ENTROPY, HYSTERESIS, LATENT HEAT, SALTS, \*Ordering, SCANNING, SENSITIVITY, SPECIFIC HEAT, ALTERNATING CURRENT, VIBRATION, ORGANIC COMPOUNDS, ORDER DISORDER TRANSFORMATIONS, CRYSTAL GROWTH, METHYL RADICALS.

INDIANA UNIV AT BLOOMINGTON DEPT OF CHEMISTRY

(U) The Synthesis and Characterization of Radical Cation Salts of Bis(Ethylenedithio)Tetraselenafulvalene,

IDENTIFIERS: (U) PE61103D, WUAFOSR3484RS, \*Ordering, \*TMTSF(Tetramethyltetraselenafulvalenium), Bechgaard salts, Differential, Molar, Tetra-fluoroborate, Young's moduli, Vibrating reed, Selena fulvalenium.

93 7P

PERSONAL AUTHORS: Montgomery, L. K.; Burgin, T.; Huffman, J. C.; Carlson, K. D.; Dudek, J. D.

CONTRACT NO. F49620-92-J-0534

PROJECT NO. 3484

TASK NO. RS

MONITOR: AFOSR, XC  
TR-94-0404, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Synthetic Metals, v55-57 p2090-2095, 1993. Available to DTIC users only. No copies furnished by NTIS.

ABSTRACT: (U) Four 2:1 radical cation salts (SbF<sub>6</sub>, CF<sub>3</sub>SO<sub>3</sub>, GaCl<sub>4</sub>, CuN(CN), 2Br) of bis(ethylenedithio) tetraselenafulvalene (BETS) have been prepared and scrutinized by X-ray crystallography, DC resistivity measurements (300-10K), rf penetration depth experiments (0.5K), pressure studies (0.5-5kbar, 4K), and tight-binding band calculations. The salts are Kappa-phase, and three are metallic to low temperatures, Kappa-(BETS)<sub>2</sub> CuN(CN)2Br is isostructural with K-(ET)<sub>2</sub> CuN(CN)2Br. Organic conductors.

DESCRIPTORS: (U) \*CATIONS, \*SALTS, \*ORGANIC COMPOUNDS, \*CHEMICAL RADICALS, CRYSTALLOGRAPHY, DEPTH, MEASUREMENT, PENETRATION, PHASE, PRESSURE, TEMPERATURE, X RAYS, REPRINTS, SYNTHESIS, MOLECULAR STRUCTURE, ETHYLENE, ANTIMONY, FLUORIDES, CARBON, SULFUR, OXIDES, GALLIUM, CHLORIDES, COPPER, NITROGEN, BROMIDES, DIRECT CURRENT, POLYMERS.

IDENTIFIERS: (U) PE61103D, WUAFOSR3484RS, \*Thio, Tetraselenafulvalene, \*Selena fulvalene, B S(Bi(ethylenedithio)-tetraselenafulvalene), Tight binding, Kappa structural motif.

AD-A281 119

AD-A281 118

UNCLASSIFIED

PAGE 122 ~ T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A281 117 20/13 7/3 20/5 20/3

AD-A280 985 21/5 21/2 9/3

INDIANA UNIV AT BLOOMINGTON DEPT OF CHEMISTRY

TRW SPACE AND TECHNOLOGY GROUP REDONDO BEACH CA

(U) AC Calorimetry at CDW and SDW Transitions,

(U) Laser-Initiated Conical Detonation Wave for Supersonic Combustion. 2,

93 7P

APR 93 12P

PERSONAL AUTHORS: Chung, M.; Wang, Yiqin; Brill, J. W.

PERSONAL AUTHORS: Fendell, F.; Mitchell, J.; McGregor, R.; Sheffield, M.

CONTRACT NO. F49620-92-J-0534

PROJECT NO. 3484

CONTRACT NO. F49620-90-C-0070

TASK NO. RS

PROJECT NO. 2308

MONITOR: AFOSR, XC

TASK NO. BS

TR-94-0406, AFOSR

MONITOR: AFOSR, XC

TR-94-0376, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

Availability: Pub. in Synthetic Metals, p55-57 p2755-2760, 1993. Available to DTIC users only. No copies furnished by NTIS.

Availability: Pub. in Jnl. of Propulsion and Power, v9 n2 p182-190, Mar-Apr 93. Available to DTIC users only. No copies furnished by NTIS.

ABSTRACT: (U) We have measured the specific heat at the SDW transition in K-(BEDT-TTF)2CuN(CN)2C1 and the CDW transitions in ZrTe3, blue bronze, and (TMTSF)2ReO4. No anomaly is observed at the SDW transition. For ZrTe3, a small peak, delta c sub p approx. 0.065R, is observed. For blue bronze and (TMTSF)2ReO4, the changes in c sub p are 3-4 times their calculated mean-field values, as expected for 1-D systems. For (TMTSF)2ReO4, there is also sample dependent latent heat associated with anion ordering. Organic superconductor, SDW, CDW.

DESCRIPTORS: (U) \*SPECIFIC HEAT, \*SUPERCONDUCTORS, \*TRANSITIONS, \*ORGANIC MATERIALS, \*CALORIMETRY, ANIONS, ANOMALIES, BLUE(COLOR), BRONZE, LATENT HEAT, MEAN, REPRINTS, ZIRCONIUM, TELLURIDES, COPPER, NITROGEN, RHENIUM, CHLORIDES.

IDENTIFIERS: (U) PE61103D, WUAFOSR3484RS, SDW(Spin-Density-Wave), CDW(Charge-Density-Wave), AC

AD-A281 117

AD-A280 985

UNCLASSIFIED

PAGE 123

T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. T4035K

AD-A280 985 CONTINUED

practical interest, and to elucidate further the cellular structure in these mixtures, are outlined. Direct initiation of detonation, Laser ignition, Oblique detonation wave engine, Supersonic combustion

DESCRIPTORS: (U) \*COMBUSTORS, \*DETONATION WAVES, \*PULSED LASERS, \*SUPERSONIC COMBUSTION, \*AIR BREATHING ENGINES, \*SUPERSONIC FLOW, AIR BREATHING, AXISYMMETRIC, COMBUSTION, CONICAL NOZZLES, DRAG, GAS FLOW, HYDROGEN, IGNITION, INTERACTIONS, LASERS, NOZZLES, PRESSURE, THRUST, REPRINTS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2308BS, Laser ignition

AD-A280 984 21/5 21/2 9/3

TRW SPACE AND ELECTRONICS GROUP REDONDO BEACH CA

(U) Theoretical and Experimental Studies of Laser-Initiated Detonation Waves for Supersonic Combustion,

JAN 93 16P

PERSONAL AUTHORS: Chou, Mau-Song; Fendell, Francis E.; Behrens, H. W.

CONTRACT NO. F49620-90-C-0070

PROJECT NO. 2308

TASK NO. BS

MONITOR: AFOSR, XC  
TR-94-0380, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in Laser Applications in Combustion and Combustion Diagnostics, V1862, Los Angeles, CA, 19-20 Jan 93. Available to DTIC users only. No copies furnished by NTIS.

ABSTRACT: (U) Spherical detonations of C2H2/O2/N2 mixtures in an open flow system (initially at 1 atmosphere) and planar detonations of C2H2/O2 and H2/O2/C2H2 mixtures in an enclosed tube are successfully initiated by use of an ArF laser at 193 nm. The required critical energy for the initiation of spherical detonations is found to be relatively low: approx. 12 +/- 2 mJ for a 40% C2H2 in C2H2/O2 mixtures. This small critical energy may be attributed to a relatively strong absorption of C2H2 at 193 nm, and possible enhancement by the photodissociation products of C2H and H. The initiation appears to be accomplished without overdriving the mixtures through a blast wave. The critical energy, delay time, detonation velocity and pressures are measured as functions of stoichiometric mixture ratio, initial pressure and incident laser energy, for both spherical and planar detonations. Direct initiation of detonation, Laser ignition, Laser Photochemistry, Oblique detonation wave engine, Supersonic combustion

DESCRIPTORS: (U) \*DETONATION WAVES, \*IGNITION, \*SUPERSONIC COMBUSTION, \*ARGON LASERS, \*AIR BREATHING

AD-A280 985

AD-A280 984

UNCLASSIFIED

PAGE 124 T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A280 984 CONTINUED

AD-A280 982 21/4 6/10

ENGINES, ABSORPTION, BLAST WAVES, COMBUSTION, LASERS,  
PHOTOCHEMICAL REACTIONS, PHOTODISSOCIATION, PRESSURE,  
TUBES, VELOCITY, REPRINTS, SUPERSONIC FLOW.

ARIZONA UNIV TUCSON

(U) The Chronic Effects on JP-8 Jet Fuel Exposure on the  
Lungs.

IDENTIFIERS: (U) PE61102F, WUAFOSR2308BS, Laser ignition

DESCRIPTIVE NOTE: Final technical rept. 1 Apr 91-31 Mar  
94,

JUN 94 12P

PERSONAL AUTHORS: Witten, Mark L.

CONTRACT NO. AFOSR-91-0199

PROJECT NO. 2312

TASK NO. AS

MONITOR: AFOSR, XC  
TR-94-0382, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) There are four major findings from the three years of work devoted to the effects of chronic JP-8 jet fuel exposure on the lungs and secondary organs. These findings are the following chronic exposure to JP-8 jet fuel alters pulmonary function and lung structures with an acute response with as little as seven days of low dose, approximately 500 mg/m<sup>3</sup>, exposure to JP-8 jet fuel; chronic exposure to JP-8 jet fuel increased liver, spleen, and kidney weights compared to controls. Microscopic evaluation of liver sections were normal; however, kidney and spleen had histological changes consistent with organic solvent exposure. There is a correlation between JP-8 jet fuel exposure-induced decreases in lung Substance P levels and lung neutral endopeptidase levels. Chronic exposure to JP-8 jet fuel caused a decrease in lung Substance P levels with a corresponding increase in lung neutral endopeptidase levels; and, there is a recovery process in the 56 day low dose JP-8 jet fuel-exposed lungs as marked by a return to baseline and longitudinal control 99mTcDTPA values. The 99mTcDTPA data was very consistent with our pathologic findings of very little lung injury in the 56 day low dose JP-8 jet fuel-exposed rats. We speculate that this finding indicates that there is a 'threshold' level of JP-8 jet fuel exposure that the lungs' defense

AD-A280 984

AD-A280 982

UNCLASSIFIED

PAGE 125

T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A280 982 CONTINUED

AD-A280 981

6/4

mechanism(s) can tolerate.

DESCRIPTORS: (U) \*JET ENGINE FUELS,  
\*TOLERANCES(PHYSIOLOGY), CORRELATION, KIDNEYS, LIVER,  
LUNG, ORGANIC SOLVENTS, PULMONARY FUNCTION, RATS,  
RECOVERY, RESPONSE, SPLEEN, WEIGHT, WOUNDS AND INJURIES,  
PEPTIDES, BODY WEIGHT, PERMEABILITY, PATHOLOGY, BASE  
LINES, MACROPHAGES, PHARMACOLOGY.

IDENTIFIERS: (U) PE61102F, WJAFOSR2312AS, JP-8 Fuel,  
Endopeptidases.

DALHOUSIE UNIV HALIFAX (NOVA SCOTIA) DEPT OF PSYCHOLOGY

(U) Neurophysiological Analysis of Circadian Rhythm  
Entrainment.

DESCRIPTIVE NOTE: Annual technical rept. 1 Jun-31 Dec 93;

MAY 94 9P

PERSONAL AUTHORS: Rusak, Benjamin

CONTRACT NO. F49620-93-1-0089

PROJECT NO. 2312

TASK NO. CS

MONITOR: AFOSR, XC  
TR-94-0372, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) Loss of melatonin secretion in hamsters can alter the rhythm of melatonin sensitivity in the suprachiasmatic nuclei (SCN) as tested in an in-vitro slice preparation. The effect on melatonin sensitivity depended on whether pinealectomy or brief constant light exposure was used to reduce melatonin levels, with constant light increasing sensitivity and pinealectomy decreasing it. The same treatments also eliminated or reduced the amplitude of the firing-rate rhythms monitored in the SCN slice preparation. These results imply a role for pineal melatonin in the maintenance of the normal amplitude of the SCN pacemaker's output rhythms. Serotonin and melatonin were determined to suppress photic responses of SCN cells and intergeniculate leaflet cells studied in vivo. Serotonin appears to act at both targets via a receptor that is similar to the serotonin-1A receptor type, while melatonin acts via a non-serotonergic receptor. Gastrin-releasing peptide (GRP) causes increased firing of about 50% of SCN cells tested in a slice preparation; the proportion of responsive cells depends on the circadian phase tested. GRP injected into the SCN in vivo causes phase-dependent phase shifts that resemble those caused by light pulses.

DESCRIPTORS: (U) \*NUCLEI, \*CIRCADIAN RHYTHMS,

AD-A280 982

AD-A280 981

UNCLASSIFIED

PAGE 126

T4

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A280 981 CONTINUED

AD-A280 980 20/1 7/6

\*NEUROPHYSIOLOGY, AMPLITUDE, CELLS, CONSTANTS, FIRING RATE, GASTRIN, HAMSTERS, LIGHT, LIGHT PULSES, MAINTENANCE, MELATONIN, OUTPUT, PEPTIDES, PHASE, PREPARATION, PULSES, RATES, REDUCTION, RESPONSE, SECRETION, SENSITIVITY, SEROTONIN, TARGETS, IN VITRO ANALYSIS.

PURDUE RESEARCH FOUNDATION LAFAYETTE IN

(U) Nonlinear Optical and Charge Distribution Studies Probing Electric Field Effects in Polymer Thin Films for Second Order Nonlinear Optics.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2312CS,  
SCN(Suprachiasmatic Nuclei)

DESCRIPTIVE NOTE: End-of-year technical rept. 1 May 93-30  
Apr 94,

MAY 94 24P

PERSONAL AUTHORS: Lackritz, Hilary S.

CONTRACT NO. F49620-93-1-0158

PROJECT NO. 2303

TASK NO. CS

MONITOR: AFOSR, XC  
TR-94-0387, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The effect of large magnitude electric fields on polymer thin films is investigated in order to improve poling efficiencies in polymer films for second order nonlinear optical applications. This research determines the charge distribution, symmetry, and magnitude across doped and undoped glassy polymer thin films as a function of temperature, time, and poling (processing). Electrochromism, second order nonlinear optics, dielectric relaxation, isothermal current and surface voltage decay measurements will be used to determine the material properties. Trapping levels and sites will also be examined. By using dielectric relaxation and optical techniques we will explore how applied electric fields affect rotational mobility of small chromophores in polymer hosts. We expect to be able to improve poling efficiency and thus device performance both by achieving the greatest possible fields with the best magnitude and symmetry characteristics, and enhancing the temporal and thermal properties of the films by manipulating their charge storage and transport properties. This understanding will allow the most efficient development and design for nonlinear optical materials. Second Order Nonlinear Optical Polymers, Electric field Effects, Polymer Dynamics

AD-A280 981

AD-A280 980

UNCLASSIFIED

PAGE 127

T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A280 980 CONTINUED

AD-A280 978 6/14

ROCHESTER UNIV NY DEPT OF ANATOMY

DESCRIPTORS: (U) \*NONLINEAR OPTICS, \*POLYMERS, CHROMOPHORES, DIELECTRICS, ELECTRIC FIELDS, MOBILITY, OPTICAL MATERIALS, RELAXATION, SYMMETRY, TEMPERATURE, THERMAL PROPERTIES, THIN FILMS, TRANSPORT PROPERTIES, VOLTAGE, PHOTODIODES, HARMONICS, CHROMATOGRAPHY, OPTICAL STORAGE.

(U) Transplantations and Cloning of an Immortal Cell Line from Rat SCN.

DESCRIPTIVE NOTE: Final technical rept. 1 Apr 93-31 Mar 94,

IDENTIFIERS: (U) PEG1102F, WUAFOSR2303CS, Electrochromism

MAY 94 25P

PERSONAL AUTHORS: Earnest, David; Rea, Michael; Gannon, Robert

CONTRACT NO. F49620-91-1-0294

PROJECT NO. 2312

TASK NO. CS

MONITOR: AFOSR, XC  
TR-94-0373, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) Primary cells from the anlagen of the rat suprachiasmatic nucleus (SCN) have been immortalized by infection with a retroviral vector encoding the adenovirus E1A oncogene. The resulting neural cell lines (SCN1.4 and 2.2) are characterized by extended growth potential without neoplastic activity, uniform nuclear expression of E1A protein and heterogeneous cell types in various stages of differentiation. The SCN1.4 and SCN2.2 lines exhibit many cells with glial morphologies and a small, stable population of cells with neuronal characteristics. Differentiated neuron-like cells are distinguished by fine processes and immunostaining for neuronal markers and peptides found within SCN neurons in situ. Concordant with immunostaining data, content, release and mRNA expression of SCN neuropeptides in both lines followed a distinct pattern with somatostatin and vasopressin cells representing the most and least common peptidergic phenotypes, respectively. Since E1A-immortalized cells from the primordial SCN can differentiate into neurons with mature, parental-like phenotypes, the initial project objective was to determine whether the lines also retain the distinctive function of the SCN to generate circadian rhythms. Circadian wheel-running activity was restored in approx.

AD-A280 980

AD-A280 978

UNCLASSIFIED

PAGE 128 T4 CLK



UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. T4035K

AD-A280 978 CONTINUED

AD-A280 977 6/4 6/12

40% of SCN-lesioned hamsters following transplantation of immortalized cells, suggesting that circadian timekeeping may be a stable functional property of these lines. The project has also yielded clonal lines of immortalized cells that exhibit specific SCN phenotypes and may provide models for studying the regulation of neuropeptide gene expression and the role of peptidergic cells in mammalian circadian timekeeping. Circadian rhythms, Biological clock, Oscillation, Suprachiasmatic nucleus, Immortalized cell lines, Transplantation

DESCRIPTORS: (U) \*BIOLOGICAL RHYTHMS, \*CIRCADIAN RHYTHMS, \*GENES, \*TRANSPLANTATION, CELLS, CLOCKS, CODING, FINES, FUNCTIONS, HAMSTERS, IONS, MARKERS, MODELS, NERVE CELLS, PATTERNS, PEPTIDES, PITUITARY HORMONES, POPULATION, PROTEINS, RATS, REGULATIONS, RELEASE, UNIFORMS, WHEELS, CLONES.

IDENTIFIERS: (U) PE61102F, WUAFOSR2312CS, Biological clock, SCN(Suprachiasmatic Nucleus), Oncogene

TORONTO UNIV (ONTARIO) DEPT OF PSYCHOLOGY

(U) Cell Culture and Transplantation of the Suprachiasmatic Circadian Pacemaker.

DESCRIPTIVE NOTE: Annual rept. 30 Sep 92-29 Sep 93,

SEP 93 5P

PERSONAL AUTHORS: Ralph, Martin R.

CONTRACT NO. F49620-92-J-0517

PROJECT NO. 2312

TASK NO. CS

MONITOR: AFOSR, XC  
TR-94-0374, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The general aim of the research supported by AFOSR is to understand how circadian rhythms in mammals are generated and controlled. We have used a variety of techniques to ask such questions as: (1) How does photic information reach and affect the clock? (2) What is the nature of the electrical events in pacemaker cells responsible for the generation and expression of rhythmicity? (3) What are the biochemical components of the pacemaker system? In particular, we have used the tau (period) mutation in the golden hamster, to pursue experiments designed to eventually identify mammalian circadian pacemaker cells.

DESCRIPTORS: (U) \*CIRCADIAN RHYTHMS, \*PACEMAKERS, CELLS, HAMSTERS, MAMMALS, MUTATIONS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2312CS, Suprachiasmatic

AD-A280 978

AD-A280 977

UNCLASSIFIED

PAGE 129

T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A280 973 20/4 9/3

AD-A280 973 CONTINUED

CALIFORNIA UNIV DAVIS

IMAGES.

(U) Measurements and Simulations of Particle Dispersion in a Turbulent Flow, IDENTIFIERS: (U) PEG1102F, WUAFOSR2308BS.

92 14P

PERSONAL AUTHORS: Call, C. J.; Kennedy, I. M.

CONTRACT NO. AFOSR-89-0392

PROJECT NO. 2308

TASK NO. BS

MONITOR: AFOSR, XC  
TR-94-0377, AFOSR

UNCLASSIFIED REPORT

Availability: Pub. in International Jnl. Multiphase Flow, v18 n6 p891-903, 1992. Available to DTIC users only. No copies furnished by NTIS.

ABSTRACT: (U) A particle imaging technique has been used to collect droplet displacement statistics in a round turbulent jet of air. Droplets are injected on the jet axis, and a laser sheet and position-sensitive photomultiplier tube are used to track their radial displacement and time-of-flight. Dispersion statistics can be computed which are Lagrangian or Eulerian in nature. The experiments have been simulated numerically using a second-order closure scheme for the jet and a stochastic simulation for the particle trajectories. Results are presented for non-vaporizing droplets of sizes from 35 to 160 micrometers. The simulations have underscored the importance of initial conditions and early droplet displacement history on the droplet trajectory for droplets with large inertia relative to the turbulence. Estimates of initial conditions have been made and their effect on dispersion is quantified. Particle dispersion, Shear flow, Droplets, Stochastic simulation

DESCRIPTORS: (U) \*PARTICLE TRAJECTORIES, \*TURBULENT FLOW, \*DROPS, DISPERSIONS, DISPLACEMENT, INERTIA, LASERS, PHOTOMULTIPLIER TUBES, SIMULATION, TRAJECTORIES, TURBULENCE, JET FLOW, REPRINTS, COATINGS, WASTE DISPOSAL,

AD-A280 973

AD-A280 973

UNCLASSIFIED

PAGE 130 T' X

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A280 956 5/8

AD-A280 941 11/4 12/9

WASHINGTON STATE UNIV PULLMAN DEPT OF PSYCHOLOGY

MSNW INC SAN MARCOS CA

(U) Augmentation of Research on Cognitive Control.

(U) Structural Integrity of Intelligent Materials and Structures.

DESCRIPTIVE NOTE: Annual technical rept. 1 May 93-30 Apr 94,

DESCRIPTIVE NOTE: Final rept. 15 Jul 93-15 Jan 94,

JUN 94 9P

FEB 94 68P

PERSONAL AUTHORS: Whitney, Paul

PERSONAL AUTHORS: Sullivan, Brian J.; Buesking, Kent W.

CONTRACT NO. F49620-92-J-0243

REPORT NO. BS-559

PROJECT NO. 3484

CONTRACT NO. F49620-93-C-0052

TASK NO. S4

MONITOR: AFOSR, XC

TR-94-0370, AFOSR

MONITOR: AFOSR, XC  
TR-94-0370, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) The influence of individual differences in working memory span (WMS) on comprehension of instructional text was examined. Results from the second year of the AASERT grant showed that readers across the range of WMS paid special attention to thematic statements when they read instructional texts. This was shown through longer reading times of sentences in the initial position of paragraphs. However, if comprehension of specific details was stressed by asking about details after each passage, then high WMS readers increased thematic processing in comparison to reading times obtained when the questions asked about topics and details. Low WMS readers did not increase thematic processing when details were stressed. The increased thematic processing by high WMS readers was associated with better comprehension of both topics and details on a later surprise test of learning. Higher WMS may allow some readers to use integrative strategies not available to other readers

DESCRIPTORS: (U) \*COGNITION, \*INDIVIDUALIZED TRAINING, MEMORY(PSYCHOLOGY), COMPREHENSION, INFORMATION PROCESSING, TEXT PROCESSING.

IDENTIFIERS: (U) PE61103D, WUAFOSR3484S4, Individual differences.

AD-A280 956

AD-A280 941

UNCLASSIFIED

PAGE 131

T4035K

ABSTRACT: (U) This report focuses on the development of micromechanical algorithms for shape memory alloy composite materials. The composite cylinders assemblage algorithm was utilized to determine the effective thermomechanical properties of shape memory alloy composites. The mathematical development based on this micromechanical model was coded and exercised to predict the response of shape memory alloy fiber/elastomer matrix composites to arbitrary mechanical and thermal loadings.

DESCRIPTORS: (U) \*ROBOTICS, \*STRUCTURAL RESPONSE, \*THERMOMECHANICS, COMPOSITE MATERIALS, MICROMECHANICS, SHAPE, ALGORITHMS, FIBER REINFORCED COMPOSITES, ELASTOMERS, MATRIX MATERIALS, MATHEMATICAL MODELS, ACTUATORS, CYLINDRICAL BODIES.

IDENTIFIERS: (U) Structural integrity, \*Smart materials, \*Shape memory alloys.

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. T4035K

AD-A280 938 21/4 20/8 20/5 20/3  
UNIVERSITY OF WESTERN ONTARIO LONDON DEPT OF PHYSICS

AD-A280 937 5/8  
MINNESOTA UNIV MINNEAPOLIS DEPT OF PSYCHOLOGY

(U) Atomic Processes Relevant to Antimatter Fuel  
Production and Storage.

(U) Cognitive/Self-Regulatory Aptitudes and Instructional  
Methods for Complex Skill Learning.

DESCRIPTIVE NOTE: Final rept. Jun 93-May 94,

DESCRIPTIVE NOTE: Annual technical rept. 1 Mar 93-28 Feb  
94,

MAY 94 51P

MAY 94 10P

PERSONAL AUTHORS: Mitchell, J. B.

PERSONAL AUTHORS: Ackerman, Phillip L.; Kanfer, Ruth

CONTRACT NO. F49620-93-1-0240

CONTRACT NO. F49620-93-1-0206

PROJECT NO. 2301

PROJECT NO. 2313

TASK NO. DS

TASK NO. BS

MONITOR: AFOSR, XC  
TR-94-0383, AFOSR

MONITOR: AFOSR, XC  
TR-94-0371, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) Electric field effects have been  
identified in the dissociative recombination of H<sub>3</sub><sup>+</sup> ions.  
This process proceeds via the formation of high lying  
Rydberg states that are field ionized in the ion analyser  
in our apparatus. Reducing this field results in measured  
cross section five times larger than with the normal  
operating field. A brief update on measurements of  
simulated radiative recombination of He<sup>+</sup> is presented

ABSTRACT: (U) The research described in the proposal has  
continued on-track, and on-schedule. To date three major  
studies have been completed, and are in various phases of  
write-up and submission for publication. The studies are:  
(1) Validation of a theoretical taxonomy of perceptual  
speed abilities; (2) A study of part-task training and  
aptitude-treatment interactions in transfer of training;  
and (3) A study of the ability and self-regulatory  
aptitude components of asymptotic skills. In addition (in  
collaboration with Dr. Dan Voltz), completion work is  
taking place on the ability and volitional components of  
knowledge acquisition in an associative memory/  
substitution task. No significant impediments to the  
progress of the project have been encountered

DESCRIPTORS: (U) \*ATOMIC PROPERTIES, \*PROCESSING, \*FUELS,  
\*NUCLEAR PARTICLES, \*PRODUCTION, \*STORAGE, \*RECOMBINATION  
REACTIONS, ELEMENTARY PARTICLES, ANTIPARTICLES, CANADA,  
ELECTRIC FIELDS, DEUTERIUM, IONS, CROSS SECTIONS, HELIUM,  
DISSOCIATION, HYDROGEN, ELECTRONS, PROTONS, LASERS,  
ELECTRONIC STATES, VIBRATION, EXCITATION.

IDENTIFIERS: (U) PE61102F, WUAFOSR2301DS, Foreign  
reports, Rydberg states, \*Antimatter, Anti-hydrogen.

DESCRIPTORS: (U) \*COGNITION, \*LEARNING, \*APTITUDES,  
TRANSFER OF TRAINING, TAXONOMY, SKILLS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2313BS.

AD-A280 938

AD-A280 937

UNCLASSIFIED

PAGE 132

74

## UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A280 933 21/2 20/4 7/4 20/11 AD-A280 932 20/4

CALIFORNIA UNIV SAN DIEGO LA JOLLA

CALIFORNIA UNIV DAVIS DEPT OF MECHANICAL ENGINEERING

(U) Theories of Turbulent Combustion in High Speed Flows.

(U) A Technique for Measuring Lagrangian and Eulerian Particle Statistics in a Turbulent Flow,

DESCRIPTIVE NOTE: Annual rept. Apr 93-Apr 94,

91

7P

MAY 94 6P

PERSONAL AUTHORS: Libby, P. A.; Williams, F. A.

PERSONAL AUTHORS: Call, C. J.; Kennedy, I. M.

CONTRACT NO. F49620-92-J-0184

CONTRACT NO. AFOSR-89-0392

PROJECT NO. 2308

PROJECT NO. 2308

TASK NO. BS

TASK NO. BS

MONITOR: AFOSR, XC  
TR-94-0375, AFOSRMONITOR: AFOSR, XC  
TR-94-0378, AFOSR

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

ABSTRACT: (U) This research involves theoretical studies of the chemical and fluid-mechanical phenomena which make turbulent combustion in high-speed flows different from such combustion in low-speed flows. Finite-rate chemistry plays a significant role in high-speed flows because of the small ratios of flow times to chemical times. The studies address ignition and extinction phenomena in nonpremixed turbulent combustion of hydrogen-air systems by both numerical and asymptotic methods. Attention also is paid to effects of compressibility in high-speed turbulent combustion, with consideration given to interdispersal configurations of shocklets and flamelets. Efforts are made to provide a firmer foundation for the modeling of high-speed turbulent reacting flows, to aid in the development of a formulation which gives results that can be compared with experiments on turbulent combustion. (Author)

DESCRIPTORS: (U) \*COMBUSTION, \*TURBULENT FLOW, \*VELOCITY, \*FLAMES, CHEMICAL REACTIONS, FLUIDS, MECHANICAL PROPERTIES, RATIOS, TIME, IGNITION, EXTINCTION, HYDROGEN, AIR, NUMERICAL ANALYSIS, COMPRESSIVE PROPERTIES, DISPERSIONS, CONFIGURATIONS, MODELS, FORMULATIONS, DIFFUSION, SUPERSONIC FLOW, KINETICS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2308BS, Finite rate, Non-premixed, Asymptotic method, Shocklets.

AD-A280 933

AD-A280 932

## UNCLASSIFIED

PAGE 133

T4035K

ABSTRACT: (U) An experimental technique is described which has been developed to study particle dispersion in a round turbulent jet. Droplets are injected on the jet axis, and a laser sheet and position sensitive photomultiplier tube are used to track their radial displacement. Data processing is greatly simplified compared to video or photo imaging techniques which provide similar measurements. Statistically large samples are used to calculate dispersion and axial velocity as a function of axial downstream distance or particle time-of-flight. Dispersion and velocity statistics can be computed which are Lagrangian or Eulerian in nature. The technique has been demonstrated with 69 micrometers droplets of hexadecane in a jet of air with a Reynolds number of 15,000; in principle it could be used to study the motion of very small, quasi-fluid particles. (Author)

DESCRIPTORS: (U) \*TURBULENT FLOW, \*EULER EQUATIONS, \*JET MIXING FLOW, LAGRANGIAN FUNCTIONS, PARTICLE COLLISIONS, VELOCITY, DISPERSIONS, REYNOLDS NUMBER, FLOW FIELDS, REPRINTS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2308BS.

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. T4D35K

AD-A280 931 24/4 6/13

AD-A280 930 20/4 21/2

CORNELL UNIV ITHACA NY

CALIFORNIA UNIV DAVIS

(U) Geochemical, Genetic and Physiological Control of Pollutant Biodegradation.

(U) A Simulation of Particle Dispersion in a Turbulent Jet,

DESCRIPTIVE NOTE: Annual technical rept. no. 2, 30 Mar 93-29 Mar 94,

92 17P

PERSONAL AUTHORS: Hansell, D.; Kennedy, I. M.; Kollmann, W.

APR 94 47P

PERSONAL AUTHORS: Madsen, Eugene L.

CONTRACT NO. AFOSR-89-0392

CONTRACT NO. AFOSR-91-0436

PROJECT NO. 2308

PROJECT NO. 2312

TASK NO. BS

TASK NO. AS

MONITOR: AFOSR, XC  
TR-94-0379, AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) The proposed research was designed to utilize a combination of laboratory and field studies to identify physical, chemical, genetic, and physiological influences that govern the accumulation and biodegradation of polycyclic aromatic hydrocarbons (PAHs). These and related compounds are among the chemicals whose environmental fate has been targeted by the U.S. Air Force Bioenvironmental Research Program. We have conducted a prior, independent study that has shown that, despite the presence of PAH mineralizing microorganisms, PAHs persist at a site where freshwater sediments are fed by PAH-contaminated groundwater.

DESCRIPTORS: (U) \*BIODEGRADATION, \*MICROORGANISMS, \*GROUND WATER, \*CONTAMINATION, WATER POLLUTION, SORPTION, TOXIC TOLERANCES, METABOLISM, DEOXYRIBONUCLEIC ACIDS, COAL TAR, EXTRACTION, LYSIS, CARBON DIOXIDE, NAPHTHALENES, SEDIMENTS, PHENANTHRENES, POLYCYCLIC COMPOUNDS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2312AS, PAH(Polycyclic Aromatic Hydrocarbons)

AD-A280 931

UNCLASSIFIED

Availability: Pub. in International Jnl. of Multiphase Flow, v18 n4 p559-576, 1992. Available to DTIC users only. No copies furnished by NTIS.

ABSTRACT: (U) A vortex dynamics calculation of a turbulent jet has been used to study the behavior of discrete particles in an unsteady shear flow. Both axisymmetric and three-dimensional calculations have been performed. It was found that the three-dimensional code did not show significantly different behavior in terms of azimuthal particle dispersion from the axisymmetric code under the thin vortex assumption. The full equation for particle dynamics was integrated through the flow field and the results were compared to a calculation which used only the drag force. It was found that the dispersion of droplets was underestimated typically by 25% by the simple approximation, with the greatest errors incurred for large droplets under high-pressure combustor conditions. (Author)

DESCRIPTORS: (U) \*TURBULENT FLOW, \*VORTEX SHEDDING, JET FLOW, PRESSURE DISTRIBUTION, DISPERSIONS, FLOW FIELDS, EQUATIONS OF MOTION, MASS TRANSFER, SPRAYS, COMBUSTION, REPRINTS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2308BS.

AD-A280 930



## UNCLASSIFIED

## DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. T4035K

AD-A280 928 6/4 9/3

AD-A280 927 6/3 6/1 6/11

## TEXAS UNIV MEDICAL SCHOOL AT HOUSTON

## MISSISSIPPI STATE UNIV MISSISSIPPI STATE

(U) Theoretical Modeling of Ocular Tissue Damage by Short Pulse Laser.

(U) Structure-Activity Relationships of Chlorinated Alicyclic Compounds in Catfish.

DESCRIPTIVE NOTE: Annual technical rept. 15 Apr 93-14 Apr 94,

DESCRIPTIVE NOTE: Annual rept. 15 Aug 92-14 Aug 93,

MAY 94 6P

AUG 93 3P

PERSONAL AUTHORS: Jacques, Steven L.

PERSONAL AUTHORS: Chambers, Janice E.

CONTRACT NO. F49620-93-1-0298

CONTRACT NO. F49620-92-J-0468

PROJECT NO. 2312

PROJECT NO. 3484

TASK NO. AS

TASK NO. E4

MONITOR: AFOSR, XC

MONITOR: AFOSR, XC

TR-94-0385, AFOSR

TR-94-0384, AFOSR

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

ABSTRACT: (U) The effects of short pulsed lasers in ocular tissues involve both thermal and mechanical damage. In the past year of study we have examined the literature values for the threshold radiant exposure causing 'minimal visible lesion'. In particular, the threshold exposures for short pulses in the sub-100-ps regime were examined. Two possible mechanisms of mechanical damage in the retina were considered: (1) melanosomal disruption, and (2) shock front development.

ABSTRACT: (U) The goal of the EPSCoR project is to conduct these assays in channel catfish (Ictalurus punctatus) preparations and to make the study a comparative toxicology study. During the first year of the project, Mr Carr has optimized the catfish brain membrane preparation for the assay of 35S-TBPS binding. He has expanded his background in neurochemistry to learn receptor binding methods and calculation of receptor saturation experiments for the calculation of Kd and Bmax, and he has extended his experience with radioisotope procedures and calculations. He has studied the competition of 12 of the available organochlorine compounds with 35TPBS binding to catfish brain membranes. The compounds selected for study were chosen based on high, moderate and low potency in the rat brain system. The results thus far indicate a much lower concentration of GABA receptors per unit wet weight in catfish brain compared to rat brain. In general, the organochlorine compounds tested thus far have demonstrated similar relative potency in the catfish brain as in the rat brain. Results were submitted for presentation at the Society of Toxicology annual meeting, Dallas, Texas, March, 1994. Studies of the interference of the compounds with 36Cl-flux will be initiated in the second year.

DESCRIPTORS: (U) \*TISSUES(BIOLOGY), \*LASER DAMAGE, \*DAMAGE, PULSE RATE, THRESHOLD EFFECTS, EXPOSURE(PHYSIOLOGY), VISION, THERMAL RADIATION, THERMAL SHOCK, WOUNDS AND INJURIES.

IDENTIFIERS: (U) \*Ocular tissues, Theoretical modeling, PE61102F, WUAFOSR2312AS.

DESCRIPTORS: (U) \*FISHES, \*CHLORINATION, \*TOXICOLOGY,

AD-A280 928

AD-A280 927

UNCLASSIFIED

PAGE 135

T4035K



UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A280 927 CONTINUED

AD-A280 893 6/11 7/2

\*BRAIN, MEMBRANES(BIOLOGY), NEUROCHEMISTRY, CALCULATORS,  
RADIOISOTOPE THERMOELECTRIC DEVICES, ISOTOPES, POTENCY.

MEHARRY MEDICAL COLL NASHVILLE TN

(U) Biotransformation of Toxic Metals by Bacteria.

IDENTIFIERS: (U) \*Catfish, Ictalurus punctatus, PE61103D,  
WUAFOSR3484E4.

DESCRIPTIVE NOTE: Annual technical rept. 5 Jan 93-30 Apr  
94,

MAY 94 8P

PERSONAL AUTHORS: Blake, Robert, II

CONTRACT NO. F49620-92-J-0246

PROJECT NO. 2300

TASK NO. HS

MONITOR: AFOSR, XC  
TR-94-0386, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The aims of this research are to study each of the various molecular mechanisms whereby toxic metal cations and oxyanions are chemically transformed by bacteria that live in the soil. The Xanthomonas-dependent production of metal-laden biocolloids in the presence of selected toxic metals was studied using instrumental methods commonly employed to characterize colloidal particles. Laser Doppler velocimetry, electrical impedance, and light diffraction measurements were used to characterize the red colloid of elemental selenium produced when strain OR-02 was grown in the presence of toxic levels of selenite. These methods may be applied to obtain quantitative data on any bacterial-dependent transformation of toxic metal species that results in marked changes in the solubility of the metal. Bioremediation, Selenium, Paint waste, Colloids.

DESCRIPTORS: (U) \*METALS, \*BACTERIAL TOXINS, \*TOXIC HAZARDS, BACTERIA, CATIONS, COLLOIDS, DIFFRACTION, ELECTRICAL IMPEDANCE, IMPEDANCE, LASERS, LIGHT, MEASUREMENT, PAINTS, PARTICLES, PRODUCTION, SELENIUM, SOILS, SOLUBILITY, TRANSFORMATIONS, WASTES, PSEUDOMONADACEAE, WASTES, QUANTITATIVE ANALYSIS.

IDENTIFIERS: (U) Biotransformation, Paint waste.

AD-A280 927

AD-A280 893

UNCLASSIFIED

PAGE 138

T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A280 892 7/4 9/3 7/2 20/5 AD-A280 892 CONTINUED

OHIO STATE UNIV RESEARCH FOUNDATION COLUMBUS

ATOMIC STRUCTURE, GRAPHITE.

(U) In Situ Laser Activation of Electrochemical Kinetics  
at Carbon Electrodes.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2303A1, In situ,  
HOPG(Highly Ordered Pyrolytic Graphite)

DESCRIPTIVE NOTE: Final rept. 1 Mar 91-28 Feb 94,

MAY 94 108P

PERSONAL AUTHORS: McCreery, Richard L.

REPORT NO. OSURF-768992/724639

CONTRACT NO. AFOSR-91-0213

PROJECT NO. 2303

TASK NO. A1

MONITOR: AFOSR, XC  
TR-94-0389, AFOSR

UNCLASSIFIED REPORT

ABSTRACT: (U) The overall objective of the project is to identify the structural factors which control electrochemical reactivity at carbon electrode surfaces. The approach combines structural probes such as Raman Spectroscopy, XPS, and scanning tunneling microscopy (STM) with measures of reactivity, including electron transfer rate constant and adsorption. Laser activation by short but intense laser pulses was used to modify electrode surfaces and enhance reactivity. Work to-date has revealed two important conclusions. First, the electronic properties of carbon can differ substantially from that of metals, with major effects on both kinetics and absorption. Second, the importance of carbon structure to kinetics depends strongly on the redox system in question. These conclusions are described in the following progress report with the citations in brackets referring to the publication list which follows the text

DESCRIPTORS: (U) \*ELECTRODES, \*CARBON, \*LASERS,  
\*ACTIVATION, \*ELECTROCHEMISTRY, \*KINETICS, REACTIVITIES,  
SURFACES, PROBES, RAMAN SPECTROSCOPY, X RAY PHOTOELECTRON  
SPECTROSCOPY, SCANNING, TUNNELING, MICROSCOPY, ELECTRON  
TRANSFER, RATES, CONSTANTS, ADSORPTION, PULSES,  
ELECTRONIC STATES, METALS, OXIDATION REDUCTION REACTIONS,

AD-A280 892

AD-A280 892

UNCLASSIFIED

PAGE 137

T4035K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. T4035K

AD-A280 728 20/4

AD-A280 728 CONTINUED

SPERRY RAND CORP GAINESVILLE FL SPERRY MICROWAVE  
COMPONENTS DIV

STREAMFLOW ANALYSIS.

IDENTIFIERS: (U) WJAFOSR2307DS, Vortical flow.

(U) Transonic Flow Separation in Closed Curved Channels.

DESCRIPTIVE NOTE: Final rept. 1 May 93-30 Apr 94,

APR 94 19P

PERSONAL AUTHORS: Dvorak, Rudolf

REPORT NO. Z-1195/94

CONTRACT NO. F49620-93-1-0232

PROJECT NO. 2307

TASK NO. DS

MONITOR: AFOSR, XC  
TR-94-0363, AFOSR

UNCLASSIFIED REPORT

**ABSTRACT:** (U) The predominantly phenomenological study has been oriented towards basic physical understanding of the development and structure of transonic flow in closed curved channels, namely of the strong interaction of the terminal shock wave with various vortical structures. A new classification of vortical structures according to the forces generating them has been suggested. Flow separation in this typically three-dimensional case has been analyzed and several simple separation criteria have been suggested. They can be used in the analysis of experimental results as well as in numerical studies. However, it has become obvious that the local separation criteria are not sufficient and that rather some global criteria have to be looked for. Experiments carried out so far were based on the flow and surface streamline visualization. They provide material for the basic qualitative analysis of the flow phenomena but are only of a limited value for quantitative measurements. For this purpose a double pulse laser has been commissioned with the intention to apply the particle image velocimetry.

**DESCRIPTORS:** (U) \*TRANSONIC FLOW, \*FLOW SEPARATION, SHOCK WAVES, AERODYNAMICS, THREE DIMENSIONAL FLOW,

AD-A280 728

AD-A280 728

UNCLASSIFIED

PAGE 138